All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

www.3DArtistonline.com

3DArtist

69

Practical inspiration for [illegible] community

DREAMWORKS ON DRAGONS

- Behind the scenes on *How To Train Your Dragon 2*
- Interviews with top artists
- Animation secrets

50 GODZILLA TIPS & TRICKS

MPC on its creature creation techniques

CREATE & 3D-PRINT THIS IMAGE PAGE 50

HARD SURFACE MODELLING

- Concept and design
- Sculpting and definition
- Add textures and detail
- 3D-print the finished result

ip IMAGINE PUBLISHING | DigitalEdition | GreatDigitalMags.com | ISSUE 69

The latest visual effects exposed

We go behind the scenes of explosive sci-fi thriller *Edge of Tomorrow*

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Artist info

Colie Wertz

Personal portfolio site
www.coliewertz.com
www.facebook.com/ColieWertzDesign

Country USA

Software used Maya, MARI, Photoshop, ZBrush, V-Ray, KeyShot, Procreate

We love Colie's sci-fi designs. Each one is full of imagination and purpose, fuelled by a backstory that cements the design in reality. That's how he came up with this issue's cover image, the private security patrol ship paperWasp. See how he develops his ideas on p50.

Expert hard-surface modelling page 50

> "In my scenario, slums spread across the city floor, while new high-rises spring up as a result of zoning gone awry. Fears of safety spawn private security companies to keep the cultures separate – and so the paperWasp is born"

Colie Wertz discusses his imaginative design process **Page 50**

Welcome

to the magazine and 116 pages of amazing 3D

Welcome to 3D Artist! 3D printing is becoming bigger than ever, with Autodesk now getting in on the action with its very own stereolithographic printer (p104). That's why we had cover star Colie Wertz not only focus on his hard-surface process, but also reveal at how he approaches printing his work (p50). If you're more interested in organic modelling insight then we have that too, with MPC offering 50 tips and techniques on how it created *Godzilla*'s towering star (p32). Enjoy the issue!

Chris Editor

Every issue you can count on...

1. **Exclusively commissioned art**
2. Behind-the-scenes guides to images and fantastic artwork
3. **A CD packed full of creative goodness**
4. Interviews with inspirational artists
5. **Tips for studying 3D or getting work in the industry**
6. The chance to see your art in the mag!

This issue's team of expert artists...

Colie Wertz

CG generalist and 3D printing expert Colie created our cover image this month. Find out how on p50

Uli Staiger

CINEMA 4D pro Uli reveals his C4D to Photoshop workflow. Head to p60 for his submarine tutorial

Arno Schmitz

Want to detail your Maya characters using Mudbox? Arno Schmitz details his process on p68

Gustavo Åhlén

Gustavo discusses how you can use After Effects to composite realistic holographs into your work over on p76

Jahirul Amin

The third in a series of four, this issue's cuttlefish tutorial explores the rigging of your creature, p80

Tim Hanson

MAXDEPTH's Tim Hanson takes a look at a simple way to approach your UVs in Maya, starting on p86

Gleb Alexandrov

Use Blender to create an old and worn look to your hair and fur with Blender expert Gleb, over on p88

Digital-Tutors

The CG scholars at Digital-Tutors take a look at smoothing out your After Effects animations on p90

Mike Jagodzinski

MODO 801 is out now! Long-time user Mike takes a look at the software's new capabilities on p94

Jerod Bogh

If you're a KeyShot user then you'll definitely want to turn to p96 to find out how Jerod got on with version five

Orestis Bastounis

Our resident tech expert explores the uses of the HP Z1 G2 and Lenovo ThinkPad on pages 98 and 99

Paul Champion

Paul talks with Sony Pictures Imageworks to discover how Tom Cruise's latest sci-fi was brought to life on p106

Sign up, share your art and chat to other artists at

www.3dartistonline.com

3DArtist

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Image - Chris Jones

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With over two million eyeballs on his YouTube "Eye Piece" animation (and Best of YouTube Channel selection to his credit), Chris Jones is shaking up the world of 3D CG with ultra-realistic human anatomy images that are straight up incredible. At the heart of this talented artist's pipeline is LightWave 3D.

"As a creative generalist I need to cover a lot of ground when working on 3D projects. LightWave enables me to do this without having to invest in a hodgepodge of expensive tools." – Chris Jones

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INSIDE ISSUE SIXTY-NINE

Contents 69

What's in the magazine and where

News reviews & features

8 The Gallery
A selection of inspirational artwork from across the globe

16 Community news
Pro artists offer tips for you to boost your portfolio

20 Reader's gallery
The 3DArtistOnline.com's community art showcase

24 Feature: DreamWorks on How To Train Your Dragon 2
Behind the scenes of the most anticipated animated sequel of 2014

32 Feature: 50 Godzilla tips, tricks and techniques
MPC discusses how it brought Toho Studio's radioactive beast to life

42 Feature: The CG elite speaks out on the industry today
Speakers from the Trojan Horse Was A Unicorn festival reveal all

84 Subscribe today!
Save money and never miss an issue

94 Review: MODO 801
Discover what influence The Foundry has had on Luxology's tools

96 Review: KeyShot 5
The latest version of Luxion's lighting and rendering technology is here!

98 Review: HP Z1 G2
Does HP's follow-up to its all-in-one workstation measure up?

99 Review: Lenovo ThinkPad
We see if Lenovo's ThinkPad W540 provides the power 3D needs

24

How To Train Your Dragon 2

"We wanted to make people believe in the living, breathing aspect of these dragons"

DreamWorks Animation on its stunning new sequel **Page 24**

88

Hair and fur in Blender

50

Master sci-fi concepts

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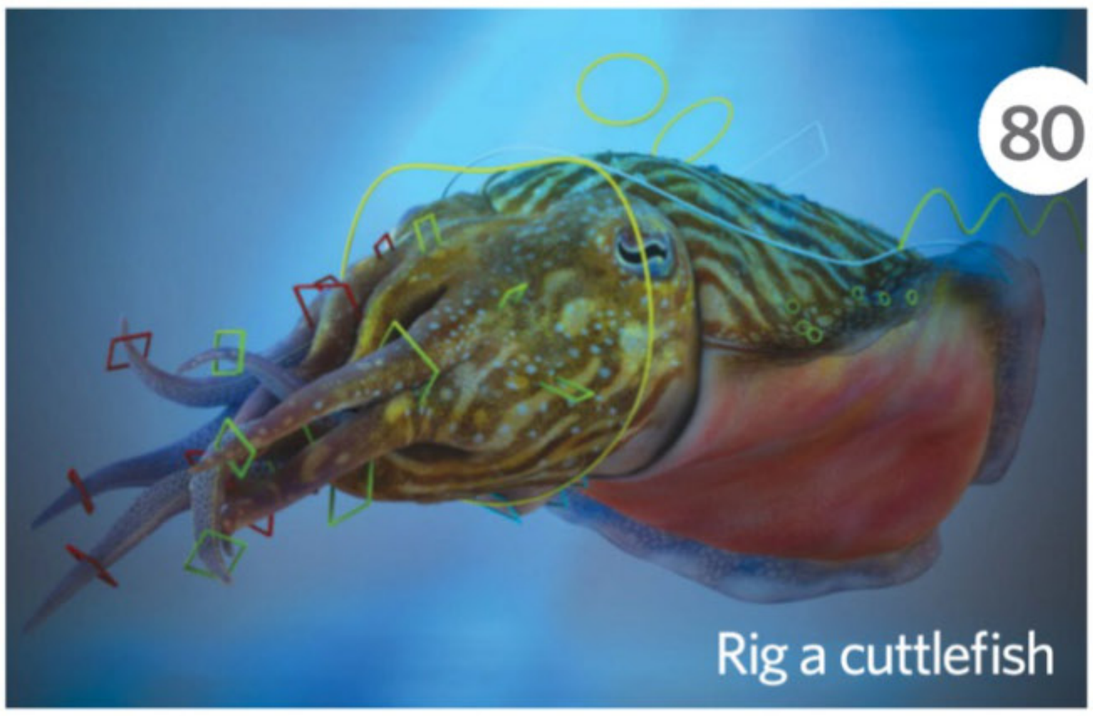
Turn to page 84 for details

68

Add character details with Mudbox



80

Rig a cuttlefish

> Godzilla had to look completely believable and animalistic, while having the ability to display personality

MPC reveals how it recreated Toho's towering beast **Page 32**

32

The studio

Professional 3D advice, techniques and tutorials

48 I Made This: The Golden Boy Carlos Vidal Torres showcases his entry into the THU Golden Ticket challenge

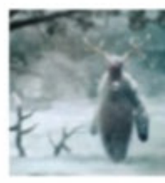
50 Step by step: Expert guide to hard-surface modelling Cover star Colie Wertz reveals his imaginative process

58 I Made This: Submarine Interior Daniel Rybkin takes us inside the shell of a submarine

60 Step by step: CINEMA 4D and Photoshop Uli Staiger discusses how to combine these two tools

68 Step by step: Detail Maya characters in Mudbox Guerrilla Games's Arno Schmitz sheds light on his process

93 I Made This: Lost Creatures Pablo Muñoz Gómez puts us face to face with Bigfoot's arctic cousin in this atmospheric piece



The workshop

Expert tuition to improve your skills

76 Masterclass: Design holographic effects Create the VFX seen in the likes of Marvel's *Iron Man*

80 Back to basics: Rig a cuttlefish in Maya You've modelled and textured your cephalopod, so now it's time to get rigging

86 Questions & Answers This section is for users who have some experience of 3D and want to learn more

Maya: Multi-Tile UVs

Blender: Hair and fur

After Effects: The Graph Editor

workspace

Industry news, career advice & more

104 Industry news Get up to speed with industry events

106 Project Focus: Edge Of Tomorrow *Groundhog Day* with aliens? Count us in!

108 Studio Access: Main Road|Post How one studio is putting Russia on the VFX map

110 Industry insider: Will Cohen The founder of Milk VFX on high-end TV visuals

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Turn to page 112 for the complete list of the disc's contents

WELCOME TO

THE GALLERY

Seven pages of great artwork from the 3D community

Images we love!

> I wanted to create something organic in both shape and texture. Jellyfish were perfect. They're complex and multi-layered, which made it difficult to replicate the way light travels through them

James Gardner-Pickett, *Jellyfish Rise*, 2014

Have an image you feel passionate about? Get your artwork featured in these pages

Create your gallery today at **www.3dartistonline.com**

Or get in touch... 3dartist@imagine-publishing.co.uk @3DArtist Facebook.com/3DArtistMagazine

Artist info

James Gardner-Pickett

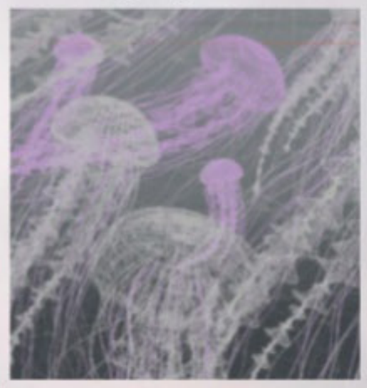
James is a self-taught CGI artist. He's spent the last seven years as CGI op at Smoke & Mirrors

Personal portfolio site
www.james-gardner.co.uk

Country UK

Software used MODO, Photoshop

Work in progress...



"A very beautiful image indeed, James has perfectly captured the challenging translucent look of the jellyfish"

Chris Editor

“What I most enjoyed about this image was the material of the street itself. It was laborious to make, but I like the result”

Gilvan Isbiro, *Davis Street,* 2013

“Combining both hyper-realism and the unbelievable with the steep road in the distance, this is one impressive render!”

Larissa Senior Staff Writer

Artist info

Gilvan Isbiro

Gilvan recently quit a five year career in the advertising industry to study programming

Personal portfolio site
www.ng3d.cgsociety.org

Country Brazil

Software used 3ds Max, V-Ray, Photoshop

Work in progress...

Nikita's imaginative images always convey interesting stories. What has happened to this character to cause him to wrap his head in old newspaper?

Chris Editor

This is the first work from a portrait series titled *Wasted*

Nikita Veprikov, *Paperhead,* 2014

Artist info

Nikita Veprikov

Nikita began working in the VFX industry in 2006. His work has won many awards over the years

Personal portfolio site
www.veprikov.com

Country Ukraine

Software used 3ds Max, ZBrush, Photoshop

Work in progress...

“We love the exaggerated features here, juxtaposed with the use of subtle tones emanating from the mushrooms. There's a very Tim Burton-esque feel about this character!”

Larissa Senior Staff Writer

Laurence Parent-Garant

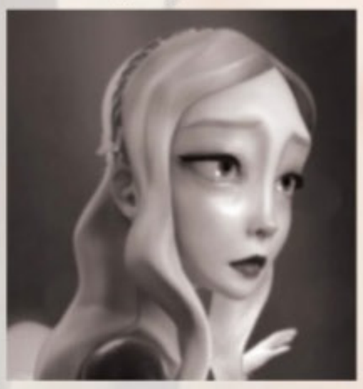
Laurence is a character artist who gets her inspiration from illustrated children's books

Personal portfolio site www.silkandporridge.cgsociety.org

Country Canada

Software used ZBrush, MARI, Maya, mental ray, Photoshop

Work in progress...



“For this image, I was inspired by the big eyes artistic movement that was popular during the Seventies. I wanted to create something beautiful and yet bizarre”

Laurence Parent-Garant, *Scarlet*, 2014

> The use of perspective and the various models that make up this scene gives this market a truly captivating atmosphere
>
> **Larissa** Senior Staff Writer

> Elements of my real life are always very important to me in my work. *The Fish Market* is a representation of my thoughts about life, busy even at 5am. This work was made for VietCG Studio's training examples. VietCG Studio loves 3D Artist magazine!
>
> **Nguyen Ngoc Luan,** *The Fish Market*, 2014

Artist info

Nguyen Ngoc Luan

3DArtist online
Username: vietcg

Personal portfolio site
www.vietcg.com

Country Vietnam

Software used
3ds Max, Photoshop

Work in progress...

Artist info

Guan Wun Wang

Guan is a CG artist currently living in Shanghai.

Personal portfolio site
www.facebook.com/kyou.zin

Country Taiwan

Software used 3ds Max, ZBrush, V-Ray, Photoshop

Work in progress...

“I love ancient Japanese culture, so for this piece I tried to combine a Japanese style with fantastical elements, inspired by all the stories of ghosts I heard as a boy”

Guan Wun Wang, *Assassinate*, 2014

“There are so many great elements and details to this image, you can't help but want to hear the story behind it”

Larissa Senior Staff Writer

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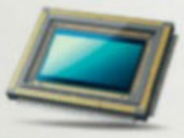

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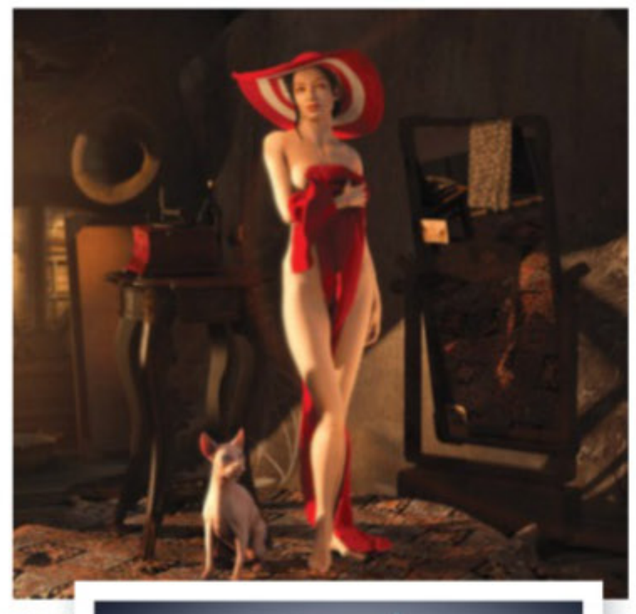
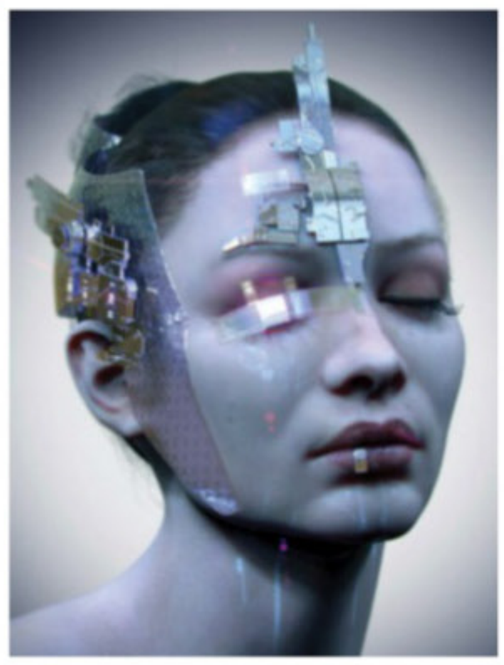
MAIN "Don't let the great quality of the works around discourage you," says Baldasseroni. "Be bold, and be passionate to reach that level. Every professional out there today started as a novice"

TOP Rusnarczyk's 3D graphics career began in 1998. He also worked as a senior character artist for game development studio, People Can Fly for six years, forming part of the team that worked on *Gears of War 3*

BOTTOM *Connection III*, which is the latest of Rusnarczyk's *Connection* series of works. The portrait was created using ZBrush, KeyShot and Photoshop





Pro tips: how to boost your portfolio

Four talented artists working today reveal the websites, communities, schools and free downloads they use to help create their work

Alessandro Baldasseroni
Lead character artist at Blur Studio / **www.eklettica.com**

Piotr Rusnarczyk
Freelance character artist / **www.sexy-polygons.com**

Eric Lyman
CG modeller at DreamWorks Animation / **www.eric3d.com**

Paul Harrison
Online 3D Tutor at Escape Studios / **www.escapestudios.com/paul-harrison**

Alessandro Baldasseroni

• **CG communities** Be active on specialised computer graphic communities where you can get real criticism, post your work and ask for feedback regularly. Some communities that provide good feedback when it comes to 3d and computer graphics are www.cgfeedback.com, www.cgsociety.org, www.zbrushcentral.com or www.polycount.com.

• **Pinterest and Google Drive** Use references whenever you approach something new, or even if is familiar, check references for nuances and subtleties. Don't assume that your design skills or your knowledge of anatomy is good enough to get the job done, whatever the project may be. Build a collection of pictures – Pinterest or Google Drive are great for this purpose. Create custom collections at the beginning of each project. This really helps to build a clear idea of what needs to be done and it will speed up the modelling process.

• **Use someone else's concepts** It's important to understand that to get hired, being able to execute existing 2D concepts in 3D is sometimes more essential than having original ideas. So, choose a concept from an artist you like, ask permission to do it in 3D and go for it, trying to match the original as best as you can. It's the easiest way to build a solid portfolio.

Piotr Rusnarczyk

• **www.cgtextures.com** If you're a CG artist, this is the best place on the whole internet. I cannot stress this enough. You'll find everything and anything there, from the texture of an elephant's skin to intricate architectonic details. Its texture library is huge and still expanding. The best part is that downloads are free until you reach the quota of 15MB, though you can become a paid member to increase this. Remember to use those resources for non-commercial purposes only.

> You have to practice like crazy. Fortunately if you love what you're doing, it's not really work
>
> **Eric Lyman**

• **www.3d.sk** I believe that every artist should have a vast choice of pictures from this portal in their reference file. It's a good investment. On many occasions this portal has spared me plenty of time browsing the web in search of a proper human body reference. The content there is very high quality – high-definition photos that can be used as a source of textures. They have a vast library and it's sensibly catalogued. I recommend it.

• **Spotify** Music is the best backdrop for work. I am one of those people that can't just work anywhere as I need specific requirements to be met. Music helps a lot, especially when I'm doing the more mundane stuff. I recommend using Spotify because it's relatively cheap and has a vast offering of choice. Music is important when you're doing something monotonous, like retopology of a high-poly model.

Eric Lyman

• **www.tech-artists.org** This is a great community of technical artists for all your scripting needs.

• **Inner dedication** If you're just starting out, make sure that you love what you're learning. To be successful requires nothing less than the type of dedication a labour of love yields. It's a harsh reality that only the very best will land good jobs, and to be in that league you have to practice like crazy and continually improve. Fortunately if you love what you're doing, it's not really work.

• **The best schools** School is optional – you can get to where you want without it, but it means you have to self-motivate that much more. Tutorials can provide the same knowledge, but you won't get the competitive environment, deadlines and stress that push people to perform their best. There is also the networking aspect to consider. Two schools that I have a high regard for are the Computer Graphics Master Academy, and for animation students, Animation Mentor.

Paul Harrison

• **Planet textures** Ever wondered where to get good textures for planets? Try www.planetpixelemporium.com. The whole solar system is there (Also take a look at NASA's Earth textures). www.cgtextures.com is also a very good source of free textures, both tileable and hi-res.

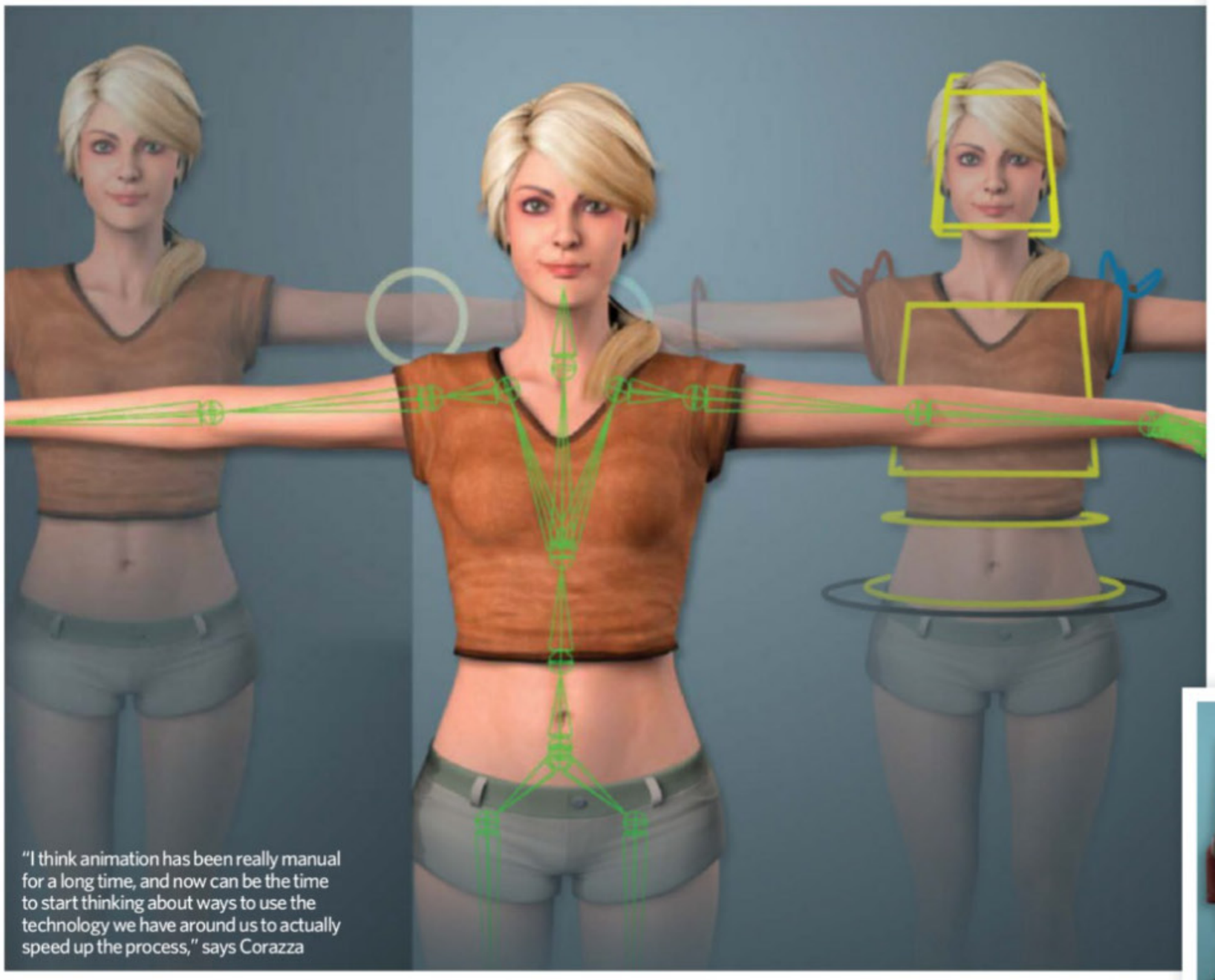
• **Free 3D scanning** For free 3D scan capture try 123D from Autodesk. You simply take multiple photos of your object or environment and you can generate textured 3D geometry. Genius! There is a even a small library of objects to play with. www.123dapp.com/catch

• **Escape Studios** We try to make the resources on the Escape Studios VLE as closely aligned with industry required skills as possible. If you're unable to enrol on an Escape course just yet, then registration/subscription to these should be your first port of call! http://learning.escapestudios.com/login

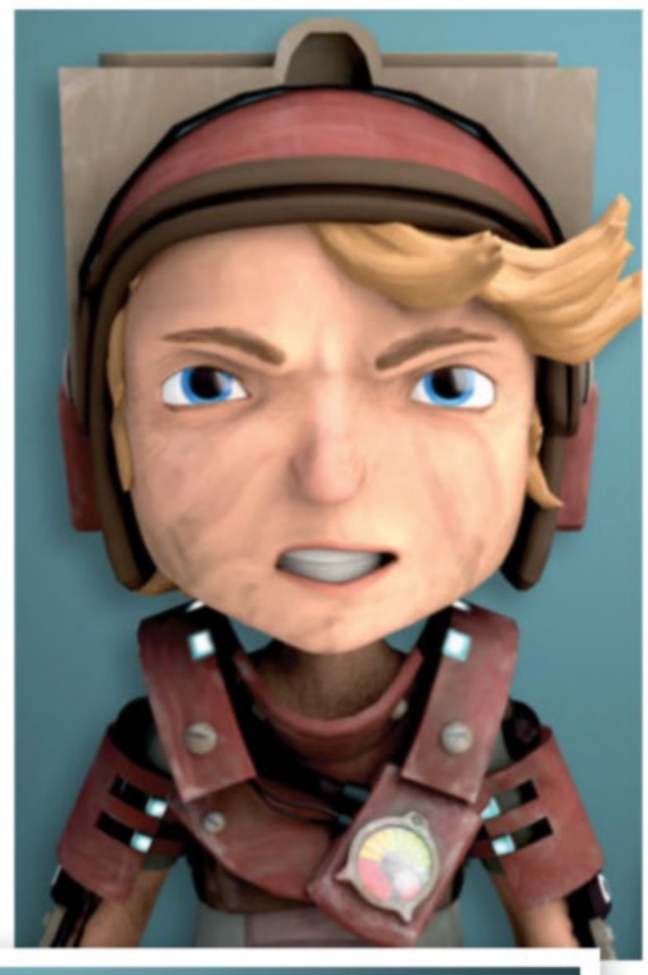
TOP Street scene by Eric Lyman, who currently works as a CG modeller at DreamWorks Animation

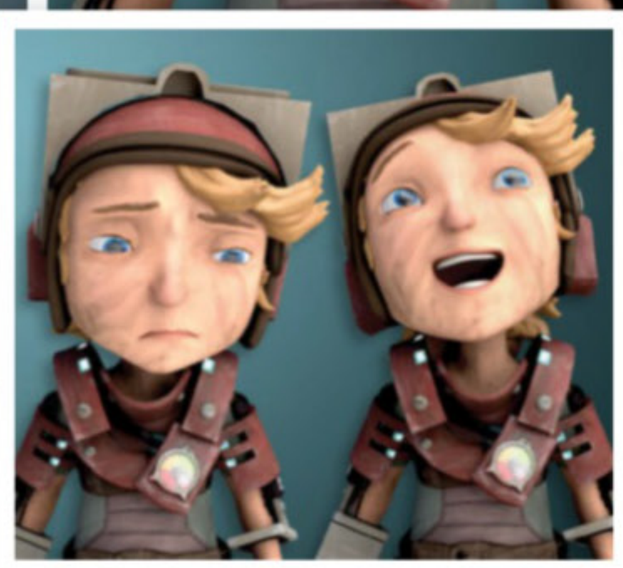
LEFT Since leaving Escape Studios nine years ago, Harrison has worked as a senior 3D generalist and lead animator for Th1ng Studios, Disney Channel, Smoke and Mirrors, BBC and Mainframe. He has now returned to Escape to teach

BOTTOM *Nikita* by Piotr Rusnarczyk was created as a portrait of an assassin doing research on her next target



"I think animation has been really manual for a long time, and now can be the time to start thinking about ways to use the technology we have around us to actually speed up the process," says Corazza





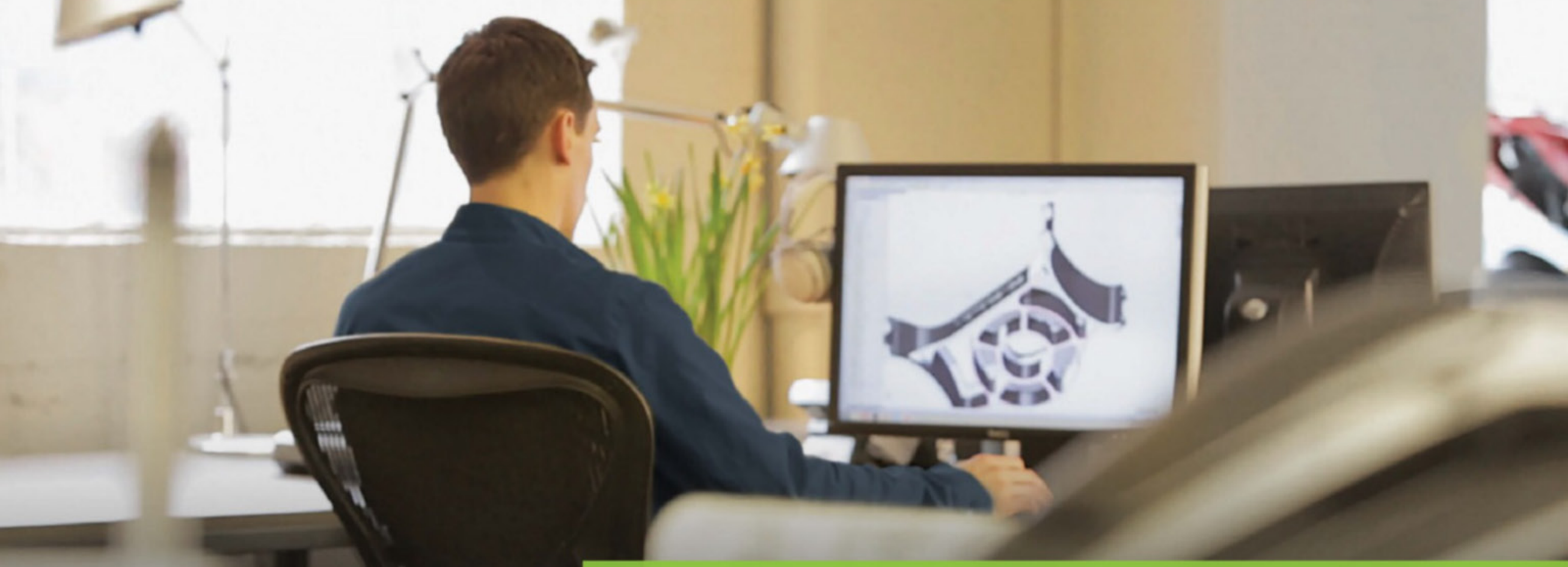
Rigging in 40 seconds

Stefano Corazza, CEO of Mixamo, explains how the automation of the technical character creation pipeline isn't too far off...

"Mixamo is a spin-off of Stanford University, where me and some other guys were originally working on markerless motion capture," begins Stefano Corazza, CEO of Mixamo. "We won some awards and we wanted to basically take that technology to a broader audience." He explains that in those years, many others studying in the same classes at Stanford were developing applications geared towards machine learning. It was then that his team first had the idea for Mixamo: an online platform that uses machine learning to be able to automatically create, rig, and animate 3D characters. For something as long-winded and technical as rigging it sounds too good to be true, but with the tool users can potentially create a character or even upload one they have already modelled in another software and professionally rig it – complete with weight-painting included – in only 40 seconds. Once rigged, a Maya or 3ds Max control rig can be downloaded and applied and the character can theoretically then be imported back into the software ready to be animated or for further tweaking.

"People upload about 10,000 characters a month. If that were manual, it would be 35 years of a rigger doing it by hand," Corazza reveals about this revolutionary tool. "It all works based on a bunch of variables, such as position of the joints or fall-off of the influence over a shoulder, all these kinds of parameters. We didn't come up with a magic formula, we just learned from a lot of very well-rigged characters from the industry, then the algorithms are basically learning what it means to rig something really well and they apply that to the character that people upload."

For the team at Mixamo, this is all about not just speeding up workflow, but also knocking down the technical barriers that come between an animator and actually animating, like rigging and painting skin weights. "Our mission is to democratise character animation," Corazza tells. "The user can just focus on the creative part, which is incidentally the part that the machines are not very good at doing with machine learning! Ultimately, there's no difference between something that is rigged by hand versus something that comes out of our system. However, if necessary you can still bring your character into Maya and modify the rig and skin weights by hand afterwards. We may not be at perfection yet, but if we get 80 or 90 per cent there one day, I will consider it a huge success."



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Images of the month

These are the illustrations that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month

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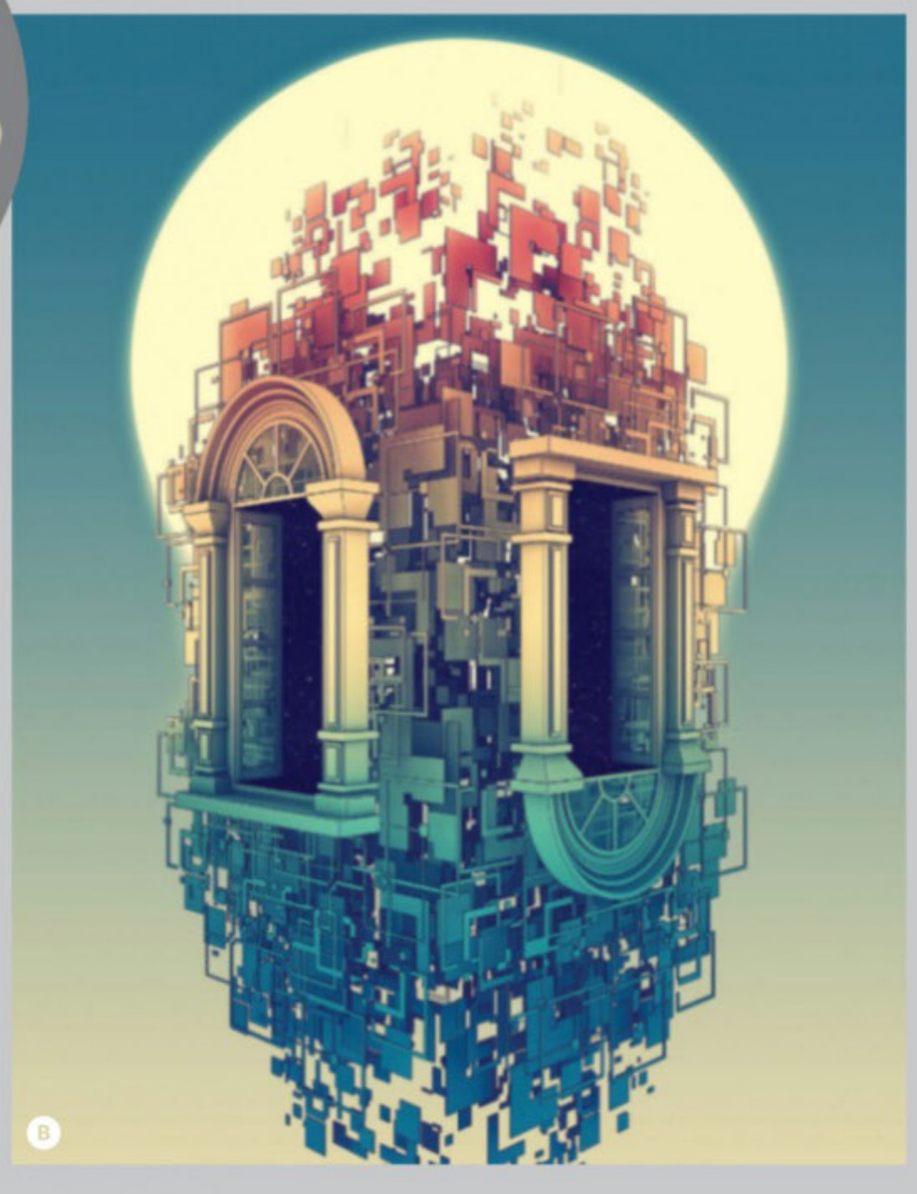
to view the art and chat to the artists

A Bugatti Veyron
» **Freddy Kurnia**
3DA username naokii
Freddy says: "For this image I set up a simple HDRI light dome, rendering it using V-Ray RT engine to explore the feel of the materials. I then created a material pass and plugged it into VrayBlendMtl so I could tweak the material more easily."
We say: *This render is as sleek and cool as the Bugatti Veyron itself, with the supercar looking well placed in the chosen environment. We'd love to 3D print ourselves one of these. Good work!*

B Within
» **Falcao Lucas**
3DA username FalcaoLucas
Falcao and Lucas say: "We used 3ds Max to model and compose most of the elements in this image. The final result was two renders, one using the default scanline renderer and one using a cel-shade renderer. Finally the renders were blended and painted over in Photoshop."
We say: *Simplicity and complexity perfectly combined. This image shows how basic geometric 2D planes can be arranged to create an utterly compelling piece of abstract 3D art. Can we get this on a t-shirt, please?*

C Juggernaut Mech Design
» **Riyahd Cassiem**
3DA username riyahdc
Riyahd says: "This is a design I worked on for a concept art lecture at Open Window, where I explored some of my processes for creating mech concepts. You can see WIP shots at **www.riyahdart.blogspot.com**"
We say: *Riyahd really can do no wrong when it comes to mechs – each one he creates seems increasingly more imaginative that the last. We love the sense of power emanating from this hulking creation – it'd make for a pretty terrifying videogame boss!*

D THU Warrior Sweetie and Bobby
» **Jit Chun Khiew**
3DA username JcKhiew
Khiew says: "This was created for the THU CG Challenge 2014. I had the idea of a little girl with her companion, Bobby, making their way towards the event. I sketched out the model using ZBrush and brought it back to Maya for texturing and rendering."
We say: *One of the great things about the art competitions running up to Trojan Horse Was A Unicorn festival are the imaginative ideas they seem to inspire in artists across the globe. Each one seems packed with individuality!*



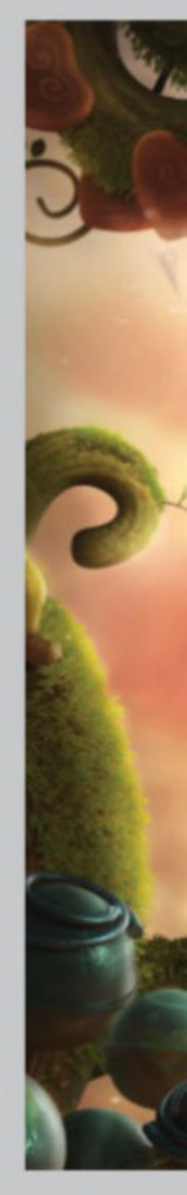


Image of the month

Bike Concept

» **Moura Machado**

3DA username jomar

Moura says: "This was created with 3ds Max, mental ray with IBL, HDR Light Studio 4 and Photoshop CS6. You can see the set-up scene on my blog at **www.jomar-machado.blogspot.com.br**"

We say: *We're loving Moura's series of vehicle concepts. There's a sense of chunkiness that gives them a personality that's often lacking in vehicle renders.*

Chubby the Unlikely Hero

» **Raul Tavares**

3DA username .@RT

Raul says: "Chubby is a very humorous little creature with round shapes that contrast with his hard skin and spiky horns. Often seen diving after fish in the clear waters of a lake or being chased after for provoking the elder dragons."

We say: *We love a backstory to a character concept and Raul's fits this mischievous dragon down to a T. It's not just the facial expression that does it, but his defiant pose.*

Forest

» **Nick Brunner**

3DA username nick_brunner

Nick says: "I took a year aside to learn how to create nature in Blender. Following this experience I made an eBook called Discovering Nature, which reveals my processes. It's $29.99 from **www.prebeoanimation.com**"

We say: *You may recognise Nick's work from the scene files that he recently provided for the 3D Artist cover disc. He's clearly quite knowledgeable when it comes to re-creating nature in Blender.*

Library Close-up

» **Sleiman Sbeih**

3DA username ssbeih

Sleiman says: "This was an image commissioned by HGroup Architects' Samir Hakim. In it we tried to introduce a warm, but minimal design."

We say: *This gorgeous-looking arch-vis interior shows how details can add to the warmth of an image. The half-drunk glasses of wine and various items give a feeling that this is a place inhabited by humans and isn't just an empty showroom.*

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We are looking for:

- 5+ years of experience as a Designer/Developer or related role
- 5+ years of exposure to Web-based technologies HTML5, MySql, JavaScript, CSS/CSS3, PHP, node.js, etc.
- Optional C++, vbscript and Qt
- Good language skills in english and german
- Experience with SEO techniques/strategies, analytics and content management
- Online portfolio of website, mobile and/or tablet experiences (examples required)

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- Maintenance of hardware

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MASTER 3D
THE DREAMWORKS WAY

HOW TO TRAIN YOUR DRAGON 2

Dean DeBlois, Simon Otto, James Baxter and Oliver Finkelde reveal how they created an animated sequel to be proud of

> I didn't want it to be another disappointing sequel, letting the audience down with something where it's the same five or six characters cast into another seemingly unimportant and somewhat random scenario
>
> **Dean DeBlois,** Writer and director

There's a lot to be said for the fact that, when 3D Artist was lucky enough be part of one of the first audiences to watch *How To Train Your Dragon 2*, many around us cried out in dismay when the movie cut two-thirds of the way through. We'd been watching a version where a few of the shots shown were not yet fully textured or animated, there was a temporary soundtrack in lieu of the completion of the final score, and the third act that had not yet been wrapped up.

It was so disappointing as, even in this early state, *How To Train Your Dragon 2* felt like a fully realised film. For director Dean DeBlois, who was called in to co-write and direct the first *How To Train Your Dragon* when it was already two years into production, this was the reaction he'd been hoping for. "I didn't want it to be another disappointing sequel, letting the audience down with something where it's the same five or six characters cast into another seemingly unimportant and somewhat random scenario," he begins. "When I was first asked to be involved to write and direct, I asked whether we could entertain the idea of a trilogy. That way, we can treat the first film as the first act, and so this can be the second and there must be a third that will culminate."

Luckily, the studio heads approved of the trilogy pitch and as early as February 2010, DeBlois sat on a picnic table at Skywalker Ranch and began to write the first outline of what would become *How To Train Your Dragon 2*, while the sound team were still finessing the final mix for the first film. A few months later, *How To Train Your Dragon* was released to huge box office success, going on to be the most critically acclaimed DreamWorks Animation film ever. Armed with the studio's freshly developed next-gen software, the team now officially had the green light to produce the second instalment.

This second act aspires to *The Empire Strikes Back*, one of DeBlois's favourite childhood films and one of the few sequels that for him, truly lives up to its predecessor. Set five years after the first film, *How To Train Your Dragon 2* is all about massively expanding on the world, introducing a host of new locations and dragon species now that the Vikings are no longer landlocked to Berk and have the entire Northern Hemisphere to explore...

Dean DeBlois Writer and director | **Simon Otto** Head of character animation
James Baxter Animation supervisor | **Oliver Finkelde** Head of character effects

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Master 3D the DreamWorks way

§ Animating dragons

For the artists at DreamWorks, two-thirds of whom had already collaborated with DeBlois on *How To Train Your Dragon*, this sequel was a chance to do much more than simply build upon the first film. They wanted to create a new world so fascinating that viewers could feel like they were truly part of it, with dragons so detailed they felt real.

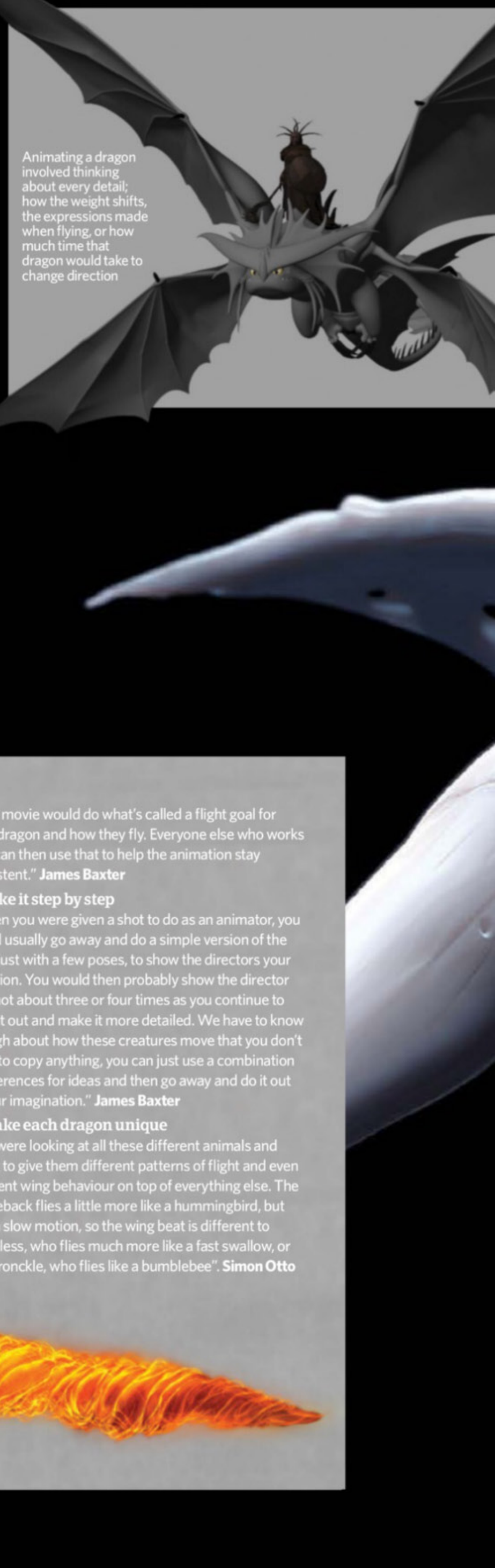
"We definitely wanted to make sure people believed in the living, breathing aspect of these dragons; that they never questioned them," affirms head of character animation for the film, Simon Otto. "That was one of Dean's early goals, to have the audience forget what medium they're watching." To achieve this, the team needed to ground the unreal in reality from the early stages of preproduction. It was something they'd already begun to work with on the first *How To Train Your Dragon*, where each dragon was planned out in such meticulous detail that even their specific fire types – ammonium nitrate mixed with anhydrous hydrazine for the Hideous Zippleback, for example – can be found on Wikipedia.

It was an approach that continued through to animation. "In order for you as the audience to fall in love with Toothless the way Hiccup does, you have to recognise something from your own life in him – the dragons cannot be abstract," Otto continues. "We all have pets, so we needed to make sure that the reasons we love our cats or our dogs so much comes through in these dragons as well."

With each new dragon, artists would think about what mixture of familiar animals its movements would be tied to, and this in turn would also influence the final biology of its design. For Toothless, initially inspired by a black panther, animators also added in the influences of everything from birds of prey to bats, dogs and horses. In the case of Hiccup's mother, Valka, her chosen dragon Cloudjumper needed to be an elitist; stuffy and mature to contrast with Toothless's youthful energy and ignorance of rank. Images of proud Great Danes at dog shows were the perfect solution, along with iridescent, fish-like scales and the movements of an owl to add a more alien quality.

"We became super-skilled internet hunters," recalls Otto. "Sometimes a couple of animators would come in and we would spend five to ten minutes just watching these YouTube videos for reference. We started creating these libraries of ideas that we then could put into the movie." Even when dealing with the vast crowds of dragons that were needed for the sequel, the DreamWorks team still made sure that each was unique with a modular dragon design system; a menu that enabled the artists to build their own unique breed with multiple choices for parts, such as claws, wings and many different body types.

Before the animators could get started on one of the most important things of all, however – how each dragon would fly – they needed to go through two weeks of flight school.



Animating a dragon involved thinking about every detail; how the weight shifts, the expressions made when flying, or how much time that dragon would take to change direction

Flight school

There would be no point in animating the other movements of the dragons to seem so real and alive if their flight felt unbelievable – and how a bird flaps its wings is a surprisingly complex movement to reproduce. "If you really want to be a good animator you have to learn and understand how the world moves; why you put your feet where you do, how you control your weight, and how you communicate that through an image," explains animation supervisor James Baxter. "With dragons, that was about learning the physics of flight and how it works."

"We didn't want to base our knowledge of flight on our memory or something that maybe is cliché," agrees Otto. "Every animator spent two weeks studying material I had collected and we gave them lectures on flight. Then, the animator had to do a certain amount of animation tests, like a simple flying dragon. There was also a part where you'd make the dragon land and take off and learn to animate the transfer of weight in the movements – we went pretty deep into understanding the mechanics of that."

How to make a dragon fly: Important theories and techniques

1. The Bernoulli principle

"The first thing you needed to know is just how Bernoulli's principle works. You know that boomerang shape that every wing has to have? It's crucial – it basically means that the air pressure from air flying below the wing will be higher than above the wing, which creates dynamic pressure, and that's what creates lift." **Simon Otto**

2. Analyse your references

"Flight school was really all about seeing when something's not working. We looked at a lot of live-action bird footage, but we also looked at a lot of movies and we tried to pick up on things that weren't working very well and tried to figure out why. I think from the first to the second movie we've progressed with flight because by the end, our animators could pick up on every detail." **Simon Otto**

3. Stay consistent

"We do a lot of experimental animation before we start these movies. We usually try to set the style of each character through this, then someone at the beginning of the movie would do what's called a flight goal for each dragon and how they fly. Everyone else who works on it can then use that to help the animation stay consistent." **James Baxter**

4. Take it step by step

"When you were given a shot to do as an animator, you would usually go away and do a simple version of the shot, just with a few poses, to show the directors your intention. You would then probably show the director the shot about three or four times as you continue to flesh it out and make it more detailed. We have to know enough about how these creatures move that you don't need to copy anything, you can just use a combination of references for ideas and then go away and do it out of your imagination." **James Baxter**

5. Make each dragon unique

"We were looking at all these different animals and trying to give them different patterns of flight and even different wing behaviour on top of everything else. The Zippleback flies a little more like a hummingbird, but just in slow motion, so the wing beat is different to Toothless, who flies much more like a fast swallow, or the Gronckle, who flies like a bumblebee". **Simon Otto**

Valka's Bewilderbeast was created to further the introduction of the dragon hierarchy that was first touched upon with the Red Death queen in the first film. The Bewilderbeast was first developed to be similar to a woolly mammoth – one of the rarest of all dragons

Master 3D the DreamWorks way

MAIN After *Mr. Peabody and Sherman* and *Turbo*, which took $57 million and $13.5 million writedowns respectively, *How To Train Your Dragon 2* is set to be have much better results

LEFT "It's always easier to sign people on when you already have a successful film behind you," tells DeBlois. When the team were nominated for an Oscar, he introduced himself to Cate Blanchett and said he'd written a part for her in the sequel. With three boys who loved the original, she readily accepted

RIGHT Learning the physics of flight for *How To Train Your Dragon 2* was even more important: all the Vikings, including Toothless and Hiccup, have had five years of practice flying together by the time the story begins

Next-gen software

"The studio basically came to our animators and said, 'if you were not limited by speed or processing power and everything was always in real-time, how would you design your software'," remembers Simon Otto. "We thought well, it must be a joke. Then the software engineers showed us some examples of what they were actually doing and we started believing it." The animators, many of whom had backgrounds in traditional 2D animation before DreamWorks, discussed the advantages of hand-drawn animation. Others, who had been accustomed to physically touching and moving their characters with stop motion, also gave feedback.

The result was Premo – one of a brand-new generation of animation and lighting tools designed in-house. After five years of being in development, animators would finally get to use it for *How To Train Your Dragon 2*, which became the very first DreamWorks movie to use the new software throughout production. For DeBlois, it has directly resulted in some of the best animation he's ever seen. "Before, animators had to work with a lot of numeric inputs and have very slow renders," he explains. "Now, they work in a real-time environment with tablets and a stylus where they can manipulate anything they want on the character and create keyframes, and it all manages to render seamlessly in real-time."

"It's a little bit like going from an Eighties phone to a modern-day touch phone," agrees Otto. Premo allowed the team to work in hi-res at any given moment, having much more freedom when it came to the limitations of how much geometry the computer could handle. Hiccup's new flight suit could be built in a lot of detail, and a huge multitude of different dragons could now appear in one shot.

"You're never interrupted, you never wait for the computer to save, to recalculate, to make a movie," continues Otto. "On one screen I can have the scene play and on the other screen I can animate and it plays any changes back to me immediately," The significant increase in speed gave animators the time to truly perfect their work – they could create several varied iterations of a shot and then pick the best, resulting in a more refined final performance. "Now, we have to sort of force ourselves to get together and have a coffee, whereas before we were in the cafeteria all the time, waiting for a shot to render!" laughs Otto.

"The software we used on Dragons 2 came at just the right time," says head of character effects, Oliver Finkelde. "I feel like if we didn't have Premo, or if we didn't have our lighting tool, Torch, it would have been very tough to make this movie." He explains that the tools did more than just help to complete the film more efficiently – they actually brought all the departments together, with all the artists being able to collaborate in a more tight-knit group. To Baxter, this marks a shift that could permanently change how animated films are made. "Because you can go faster, you don't need so many people, which means you can make more movies," he points out. "It's also better for the performance of a character if it only has three or four people working on it, because then they really understand how that character works without the animation getting too diluted by different styles."

> "I feel like if we didn't have Premo, or if we didn't have our lighting tool, Torch, it would have been very tough to make this movie"
>
> **Oliver Finkelde,** Head of character effects

Behind the scenes

§ Over 300 artists worked on the crew for *How To Train Your Dragon 2* for 27 months .

§ The flying sequence that reintroduces Hiccup and Toothless for the first time was originally a short sequence, but ultimately turned out to be twice as long as its original length

§ When Dean DeBlois first told the team that the flying scene was going to be extended and that Hiccup would be using a flight suit, Finkelde took the research a step further than many animators might dare. Over two and a half years, he learned to skydive and how to fly a wingsuit himself. "A friend of mine took a video with me in my wing suit and that really helped us to simulate the hair and clothing for the scene," Finkelde explains. The footage also helped the team make sure the flight sequences looked real – it was the perfect reference for the animators!

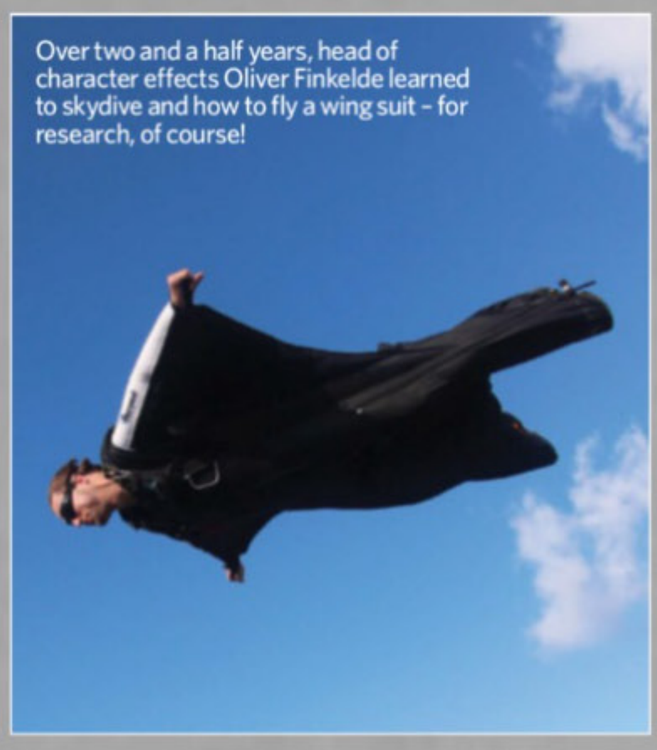
§ To animate the dragons in the film, every animator spent two weeks studying the physics and mechanics of flight as well as practicing animation tests in what was called flight school

§ One of the most difficult shots to animate was 40 seconds long. It featured all the dragons flying into battle, with the viewer seeing it all from the back of another dragon. It took around nine months to create.

§ Following the release of the first trailer, fans of the film postulated that the new fins under Toothless's chin were signs of his age, much like Hiccup's new tufts of stubble. Although these fins were not modelled intentionally to show an older version of Toothless, Baxter liked the idea and decided to add it into the movie – Hiccup's mother originally checked Toothless's teeth to learn his age, but in the final version touches his new fins instead.

§ Working with engineers from Intel and HP, DreamWorks developed a new software architecture that would allow the new tools to take advantage of the graphics cards and multi-processors in the artist's computers. *How To Train Your Dragon 2* was the first DreamWorks film to use the next generation of tools designed in-house, such as Torch and Premo.

§ Before the updates, the basic architecture of some of the programs went back 20 years. "Underneath the hood was kind of old and they had fancy stuff on top of that, so they decided it was time to start from scratch and really take advantage of what computers can do now in terms of dual-processing," says Baxter.



Over two and a half years, head of character effects Oliver Finkelde learned to skydive and how to fly a wing suit – for research, of course!

Master 3D the DreamWorks way

§ The new Vikings

Of course, even the most sophisticated tools in the world couldn't guarantee what the DreamWorks' team was really aiming for: a good sequel.

After lowering the curtains on *How To Train Your Dragon*, all of Hiccup and Toothless's problems seemed to be completely fixed, with nothing but a happy life ahead. As such, that story first outlined on a picnic table at Skywalker studios needed to truly shine, providing those same characters a whole new narrative arc. "The thing is, nobody wants to work on a movie that doesn't have a strong story," explains DeBlois. "On some of my first jobs there wasn't enough attention given to the storytelling, so all of the work that we were doing was sometimes in vain. You have really talented artists working night and day and weekends on movies that they are ultimately embarrassed to tell people they worked on. It's a terrible feeling and it's always important to me to make sure that, if I have anything to do with the story, that they want to tell people that they worked on that project."

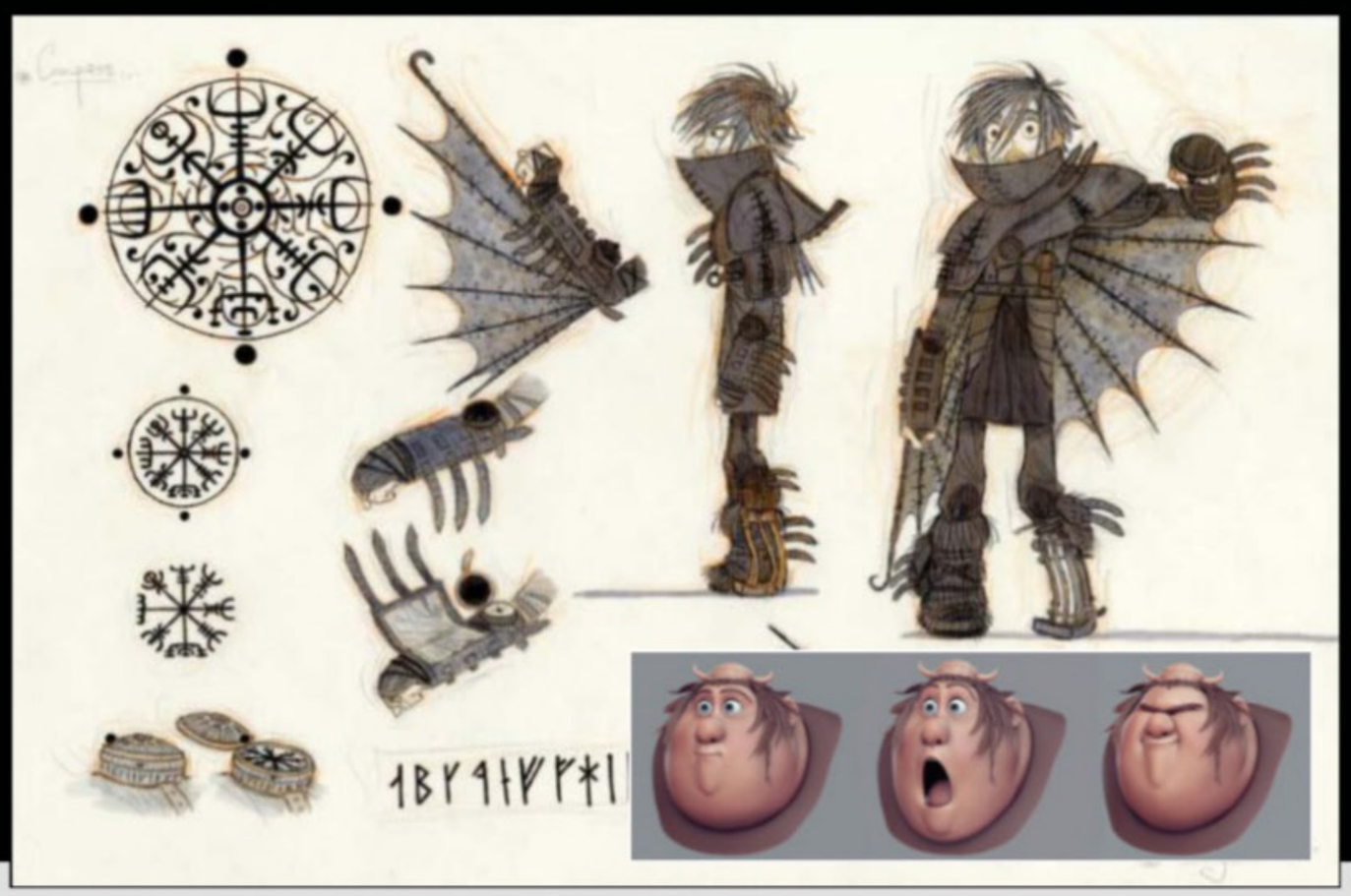
We have no doubt the artists will have much to shout about following the release of *How To Train Your Dragon 2*. "We've learnt so much from doing this movie and we want to continue developing the things that we've done," affirms Otto. "I bet you that by the time we walk into the third movie we'll have taken another big leap forward." After all the thought that went into making sure that each of the dragons flew in their own unique way down to the detail on the costumes, Otto is very proud indeed of what the team has achieved.

As for that third movie, the team hopes to continue developing what they began in 2010 – expanding the world and pushing the boundaries of what animation can do. "I don't want to spoil it, but I can tell you this," teases Otto, "DeBlois would like to end the third movie on the opening line of Cressida Cowell's children's book – 'When I was a boy, there were dragons'."

LEFT "I think that really good animators are also really good observers," says Otto, "we observe and distil what's essential about the performance of this person or animal"

TOP Snotlout concept model by Leo Sanchez. The character effects team spent time streamlining the process of running cloth, hair and fur. Ultimately, artists did not need to render to see the results in Houdini

BELOW Thanks to the next-gen software, artists had the freedom to add more detail to *How To Train Your Dragon 2*



> "We've learnt so much from doing this movie"
>
> **Simon Otto,** Head of character animation

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50 MONSTER TIPS & TRICKS FROM MPC

Godzilla director Gareth Edwards and VFX house MPC offer the essential guide to creating a monster

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Size doesn't matter. When it comes down to creating one of cinema's most iconic and enduring monsters, it's not the epic proportions that convince audiences around the world that a prehistoric creature has been brought to life to cause catastrophic destruction, but the hundreds of infinitesimal details that go into envisaging such an awe-inspiring leviathan.

The creation of Gareth Edwards' take on Toho's legendary *Godzilla* was no easy task. From the cracks that split the protruding scales running down his spine, to a furious flaring of its nostrils as he prepares for battle, the vision of award-winning VFX-wizard-turned-director Gareth Edwards matched with the considerable talents of visual effects outfit MPC to prove that, when it comes to creating a 330ft tall monster, it's the little things that really stack up.

Over the next several pages MPC provides a comprehensive guide to creating a realistic movie monster, revealing the design secrets behind *Godzilla*'s return, while director Gareth Edwards discusses how he went from being a VFX artist to directing one of 2014's biggest blockbuster films.

50 Monster tips & tricks from MPC

To aid with the animation, MPC worked alongside Andy Serkis (*Lord Of The Rings, Dawn Of The Planet Of The Apes*) and his motion capture studio The Imaginarium

DESIGN

01 **Realism** The design for *Godzilla* was all about modernising the iconic form of Toho's original design while making him believable to today's movie going audience. This meant turning to nature and integrating biological realism into the established form. Based on a 3D conceptual sculpt, we spent absolutely months refining his 3D shapes and combining them with real photo references, honing all of the details, such as scale patterns and material attributes.

02 **Unusual inspiration** The MUTO's eye design was inspired by markings on planes and used the concept of bioluminescence to give them a very graphic, but organic look.

03 **Reference** Gareth Edwards was looking for a distinctive silhouette that would be easily recognisable for the MUTOs. The intention was to create a creature whose clean lines and long limbs would contrast with Godzilla's iconic form, but still be believable as a gigantic adversary. Alongside reference from nature, concept artist Matt Allsopp looked at a lot of references of mecha from Japanese animation. There was a room in the Burnaby production office that was plastered from floor to ceiling with printouts of the whole evolutionary tree of MUTOs, which would be constantly getting marked up and drawn over. The proportions and distinctive angularity of the creatures emerged from this refinement process. The design process continued right into the post-production period as the bio-mechanics of the creatures and their performance in shots informed their design.

04 **Personality** Godzilla had to look completely believable and animalistic while having the ability to display personality. We carefully introduced humanised elements to his facial performance and body language in order to display his emotions without making him a completely fantastical creature.

05 **Size** One of the main challenges of integrating such big creatures into shots is how to effectively convey their scale against the environment. Believable camera positions and movements helped the viewers to relate to the creatures in space while the FX team always added, through water or dust FX, comparison elements of their movement against gravity.

MODELLING

06 **Details** The extreme close-ups of Godzilla meant that MPC's team would have every square metre of his gargantuan form held up to scrutiny. This meant cutting him up into multiple subtools in ZBrush and detailing each one meticulously by hand. For all of the creatures in the movie, not only was it important to review the full body, but also the close-ups on hands, mouth, spikes and scales. Details are really what really add to the realism of the scenes.

07 **Topology** It's not enough just to have a nice sculpt. A good model has to feed downstream departments to allow for nice texture mapping, deformations and rendering. In this case we had to topologise Godzilla scale by scale to allow for his eventual screen resolution and the fact that many of his scales overlap and needed to slide over each other.

08 **Multiple resolutions** The render model of the creatures would have been prohibitive to work with for many of the artists at MPC. *Godzilla* ended up having five different resolutions, allowing animation, lighting and FX to work interactively. The models were also used in rigging to simulate layers of muscles, fat and skin.

09 **Eyes** In order to create life in Godzilla's eyes, intricate anatomical details were modelled, such as the meniscus fluid. Alongside complex shaders, this helped to give them depth and convincing light absorption and refractions.

10 **Face shapes** To help bring Godzilla and the MUTOs to life, MPC's animators were given a comprehensive set of shapes to simulate the firing of each facial muscle. This allows the character to emote and aid in telling the story.

11 **Flex shapes** Much like the facial shapes, body flex shapes were created to give Godzilla's mass a sense of movement. He has a number of muscle shapes sculpted for correct compression and stretching as he moves. Much like the rest of our process, this is as heavily based on reality as possible. The MUTOs had the same type of compression and stretching for the fleshy, whaleskin-like limbs, whereas the shoulders and back were treated as more rigid, hard surfaces.

ONE OF THE MAIN CHALLENGES OF INTEGRATING SUCH BIG CREATURES INTO SHOTS IS HOW TO EFFECTIVELY CONVEY THEIR SCALE AGAINST THE SURROUNDING ENVIRONMENT

MPC on why Godzilla's weight proved challenging: "Just animating something from reference and then making it slow doesn't really work to create a believable sense of weight and mass"

TEXTURING

12 **Resolution** Creating a creature at that scale, that could hold up visually when seen close up on a giant theatre screen was huge challenge. Godzilla and the MUTOs had over 80 UDIM tiles and many maps for every single one of them.

13 **Contrast frequency** Focusing too much on tiny details can be counterproductive. Zoom out and view your maps as a whole. There must be a pleasing amount of detail visible whether you're looking at a claw, or the whole creature.

14 **Work in layers** On top of the skin detail, the creatures needed to be covered in layers of dust, wounds, and other features to really add to the realism of the character. This needed to be controlled separately in shading. Keeping things separate helps them be easily editable so you can work on them at different stages.

15 **Work closely with look-dev** It's important to have a close relationship with the look-development and lighting artists. By ensuring this, it enables much quicker turnarounds in feedback for what the characters will look like within a specific shot environment. We often have to create specific maps that are tailored to very precise needs.

16 **Interpret references** Looking at animals in real life is very important for re-creating elements of a creature. Paying attention to the size of scales in flexible areas versus those in larger, more static sections is very informative. Looking at animals in this way also helped in adding wear and tear and a sense of age to the surfaces of the monsters, which ultimately added to the realism of the characters and their believability.

17 **Diffuse maps** We always take into account the shape and the form of the model to aid in describing the surface. If the texture direction is conflicting with any of the sculptural detail then the end result will look overly muddled and non-organic.

50 Monster tips & tricks from MPC

RIGGING

18 Big details mean larger poly counts The first hurdle of rigging Godzilla was the enormous polygon count. Articulation was needed in the fine scales and surface details, so we couldn't rely on displacement maps alone, so most of the detail was modelled in. To manage this we had multiple layers of mesh resolutions to simulate lower level muscle, mid-level folds, and fine creasing and scale details. A Custom Wrap deformer enabled us to bind these layers and to fine-tune the changes in surface property where the scales were more rigid on the forearms, chest and back, but more flexible at the joints. Crocodiles, alligators and Komodo dragons were great reference for this.

19 Designs evolve too, so keep it scripted Limb lengths, the number of fingers and amount of facial controls – lots of aspects of the characters changed during production, so keeping the rigs procedurally scripted helped us to update the puppets as quickly and efficiently as we possibly could.

20 Keep your physics art directed In many shots there were close-ups of legs, feet or tails, where we needed to choreograph jiggle dynamics in animation, so we added Tweak Controls to the puppets to enable the animators to keyframe dynamics. This would then pass down the pipeline to the rendered result.

21 Reference, reference, reference Whales, insects, bats and lizards were some of the influences used in the Godzilla and MUTO designs – using real-life reference for anatomy, physiology and skin properties provided a solid grounding in reality to help make the creatures so much more believable.

22 Keep your options open To make Godzilla's huge scale believable, we ran lots of simulations for muscle dynamics and skin folding to help determine the most aesthetically pleasing result for different circumstances.

23 Emphasise scale Scale was one of the biggest focuses for both the characters of Godzilla and the MUTOs. All of the rigs needed to be flexible enough to work successfully at different scales and in different shots to help compositions and shot design. This meant that any dynamics and simulated aspects also had to work at these different scales, and data was passed down the pipeline so that displacement maps and additional skin simulation would scale correctly.

ANIMATION

24 Temporary beauty Temp FX cards and lighting was a new foray for the animation team. They took some getting used to but proved invaluable. Even at an early stage of the end battle sequence we added 2D image planes of billowing smoke, bursts of impact dust and fire. The benefits of this were two-fold – our blocking looked great and it gave animation a rewarding sense of control over shot composition and mood.

25 It's all in the details On top of our advanced muscle simulation pipeline, rigs were built with controls to allow animators precise control over all aspects of facial performance and muscle dynamics. No frame was overlooked and a detail pass involving neck tensing, nostril flares and jaw flex helped conveying the creatures' personality.

26 Movement Godzilla's core rig was developed to be similar to a serpent; from head to tail tip he was connected with spline controllers. This allowed movement in his tail to affect his body and any small movement with his head could be felt in his body and down through his tail. This helped his slower movements to feel smooth and connected.

27 Godzilla-sized physics Since Godzilla stands at a staggering 350 feet, animating a creature that size and making it look believable is a challenging task. Larger creatures appear to move slowly but in order to sell their weight visually, we needed to make sure that all the overlapping animation made Godzilla feel really heavy. Every time Godzilla moved, we added in small details in the head, tail and fingers that reinforced the idea that this was a giant mass being moved around. Looking at reference of a normal-sized creature helped, but when you slow it down to be about the same speed as Godzilla the weight just isn't there. To help with that, one of our animators made a jiggle animation clip that helped us add that subtle overlapping motion that really sells each impact.

28 Physical exertion For the atomic breath we show the awesome power of the attack by means of anticipation – like a super-charged roar, you have to max out the rib cage expansion, roll his shoulders back into a epic inhale pose, hold for a beat then release as if all of his body is punching the build-up of energy out of his lungs like a chain reaction. You keep pushing forward with his body and add muscle shakes to his core and neck as he fires until the beam is finished. Making it physically taxing brings the character to life and shows the effort it takes to use his signature finishing move.

29 Animation planning When starting a shot it was important to plan ahead, especially from a timing point of view. Without planning, it would be easy to make Godzilla take three steps forward and punch before realising that all that action doesn't fit on a 110-frames shot without breaking the character's weight and size. Understanding what the core of the shot is and planning accordingly was paramount.

The final look of Godzilla's face was inspired by a range of animals, including elements of eagles, dogs and bears when it came to defining his snout. Image courtesy of Warner Bros. Pictures

30 **Iconic pose** Godzilla has an iconic silhouette. To keep true to the character we made sure that his poses were such that the audience could always see his fins and read a nice flow line from the head to the tip of the tail. On a frontal shot we would twist him a bit and push the fins to the side so they always show and tilt his head down to get that Godzilla mohawk.

GODZILLA HAD TO LOOK COMPLETELY BELIEVABLE AND ANIMALISTIC WHILE HAVING THE ABILITY TO DISPLAY PERSONALITY

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MPC's data capture team photographed multiple reptiles to create highly detailed concept imagery. This could then be used on different parts of Godzilla's body

LIGHTING

31 **Be creative** We had to find techniques to give Godzilla's blue-glowing fins a photographic look, in order to keep them in line with the realistic treatment we gave the creature. Using an array of lights positioned along the spine, we emitted an internal white light source that would generate blue-tinted subsurface scattering on the thinnest areas of the fins. This would then compute indirect specular and diffuse passes onto Godzilla's skin that could be animated in compositing.

32 **Get control** A Procedural Flow Noise shader was created in order to emulate a thin sheet of water running down the creatures' skin. It gave the lighting team control over the thickness, speed and direction of the water effect.

33 **The right reference** To successfully translate Godzilla into a photoreal living and breathing creature, the look-dev team devised multiple shader templates, reproducing different skin and scales types studied from real animals, such as lizards, alligators, crocodiles and komodo dragons. Working with the texturing team, we created a giant puzzle, associating textures and shading properties to the many different body sections, varying how the skin would absorb and reflect the light. This played a major role not only in making Godzilla as real as possible, but also in conveying his massive scale by clearly showcasing variance of light across his entire body.

34 **Layers** The look-dev took over six months on Godzilla alone. The custom shader we created had five stages of battle damage that was slowly revealed throughout the film.

35 **Convey scale** Localised lighting on the creatures was really important to show their scale against their environment as well as ensuring clarity over their silhouette and actions.

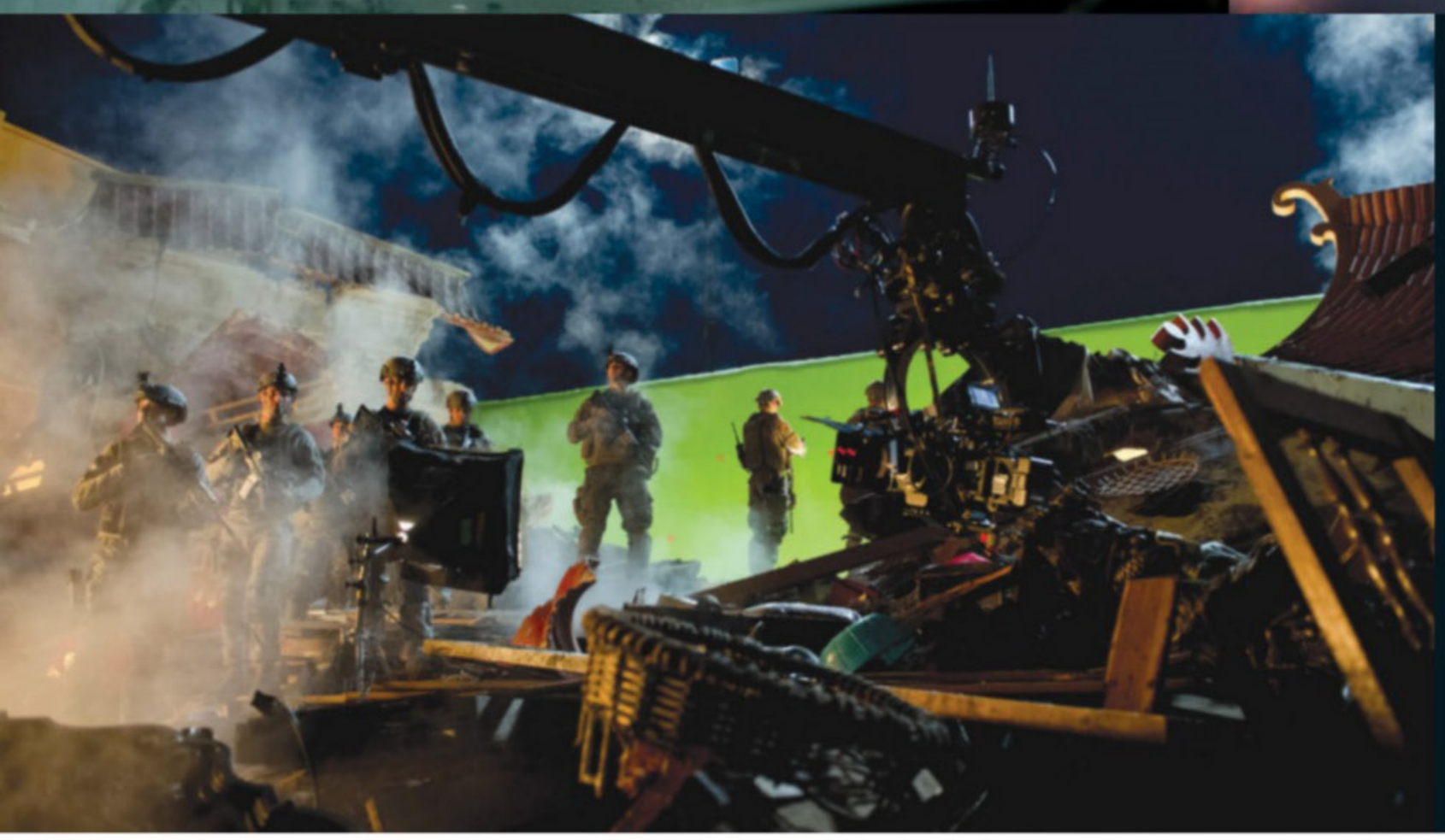
FX

36 **Good old methods** There are a lot of advanced tools and an arsenal of FX artists working on modern films. Among sophisticated fluid solvers and rigid body engines we can always find a place for old-school approaches. One of them is a simulation of sprite particles. Basically a game industry approach, sprites remain a very powerful tool to create various phenomenons. Thanks to their fast simulation time alongside properly chosen textures and carefully adjusted lights, they can complement the more complex simulations by creating very specific art directed details.

37 **Organisation** Doing FX work on a film like *Godzilla* involves creating many elements for a lot of shots, long simulation times, lots of data and many notes. Success as an FX artist depends on being organised, managing your time and not letting the flurry of tasks overwhelm you.

38 **Atmospherics** The creatures had to interact with their environment throughout the entire film. This resulted in complex and heavy interactive dust simulations. By splitting up and localising the interaction to legs, arms or fins, we were able to break simulations into velocity-based emission. This provided us with more control over how the elements would interact with the creatures, and greater art direction of the atmospherics.

Maintaining a sense of scale was paramount to Edwards' vision. Almost every scene offers a sense of perspective for the viewer



RENDERING

46 **Optimisation** Godzilla alone took on average three hours a frame to render. In early testing prior to optimisation he would take in excess of six.

47 **Volume** It took the lighting and rendering team 2,000 render machines and over six months to render the film. If we rendered everything on one machine, it would have taken us 444.8 years from start to finish.

48 **The right tools** At peak production there was a team of six monitoring the render farm 24/7 rendering about 50,000 hours per day across 912 render blades (not counting workstations) configured for 2,324 slots and 9,584 cores.

49 **Allowing time** The total render time on *Godzilla* for all shots took 3,964,652.72 hours.

50 **Space** At the peak of production, the storage system held 650 TBs of data.

One of the biggest considerations for the team at MPC was making renders quicker and more efficient, considering the simulation-heavy scenes

39 **Water tip** A 350ft swimming creature could never look huge enough if the water elements did not have the right amount of detail. Localising the fluids simulations around the characters and extending the areas with procedural waves patterns allowed us to create vast wet environments efficiently, while several layers of spray, foam, mist and extra displaced small waves textures gave the correct sense of scale in the most flexible way possible.

40 **General tip** The easiest way to achieve a challenging FX simulation is to subdivide the big tasks into different smaller ones, giving enough flexibility to isolate and resolve quickly the eventual problems that the artist will certainly find on their way to the final approval.

COMPOSITING

41 **A striking image** If you look at a classic *Godzilla* poster design he is very often presented as a silhouette against giant smoke plumes and fires (in the Polish poster for *Godzilla vs. the Smog Monster* there is a silhouette of Godzilla made out of smoke, with the smog monster's face visible). In our shots we tried to emphasise the silhouette of the beast by using the same kind of approach involving both smoke and fire, which gave the shots a degree of drama and clarity, even in a dark city that had no lights due to electricity being wiped out by an EMP.

42 **Software** A lot of the embers and ashes in the San Francisco battle scene were rendered and simulated using the particles system in The Foundry's NUKE.

43 **Deep compositing** MPC was able to really give a sense of scale to the creatures by supplementing the visual effects with photographed elements that emphasised their depth and shape, and this was integrated seamlessly by using deep pixel data.

44 **Use practical elements** Many of the fires in the night sequence were taken from practical elements of burning wood pallets. We managed to make interactive lights based around these using Normals and World Position passes.

45 **Avoid clichés** A lot of heavy-handed techniques like glows, artificial hazes and lens flares were specifically avoided in *Godzilla* in order to give clarity to the images, and clarity was very important for creating successful compositions. One of the tests we would do when laying out shots in comp would be to scale the image to a thumbnail size – if the action of the shot was readable then the balance was correct, and if it was not then we would strip a lot of the complexities away until we reached a certain level of clarity, and then start adding optical artefacts. The silhouetting techniques that we learned became very important here.

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INTERVIEW WITH GARETH EDWARDS

How did you first get into VFX and start using VFX to help create your own films?

You know, I grew up with this false perception – I always wanted to be a filmmaker and had this idea that, you know, you go to film school, you make a short film, Hollywood sees that short film and they offer for you to make a feature film and it's that simple. So I went to film school made a short film, never got a phone call from Hollywood – and it was just this massive anticlimax. It just so happened that I went to film school with an animation student who was my best friend who was studying this new thing called computer animation. When I started film school, *Jurassic Park* had just come out in the cinema and so living with him, it was clear that this was going to be the weapon of choice for a filmmaker. I was very excited and thought 'well, you don't need permission from Hollywood to make a movie'. It took me, like, a decade to learn it! It was a lot harder than I gave it credit and I was a lot worse at it than I thought, so it took me a long time to get good enough that I felt I could go and try and make a film with it. I [then] did visual effects mainly for the BBC and Discovery Channel and really felt like I had wasted my career. I reached a point where I got so frustrated with myself that I thought 'right, I'm just going to draw a line in the sand and say I'm directing'.

I just remember being on set at this BBC show and saying 'look, the light's really good up on that hill – should we just go up there to do the shot', and my producer was said that we couldn't because we were spending too much money and there were too many people so we couldn't afford to go up there. I said, 'so hang on a minute, you're saying we can't do something because we've got too many people helping us?' It was at that point where I felt like it was wrong. My response to that was to go and do *Monsters*. What I was hoping for from it was that maybe they would offer me a chance to direct an episode of *Doctor Who* or something. I was never expecting that it would register with Hollywood and that I'd finally get that call, and they would let me get to do something like *Godzilla*.

On Godzilla did you get heavily involved in the visual effects shots? Did you feel your history in the industry helped at all?

Definitely, though I'm not sure if it's a good or a bad thing because obviously having had past knowledge of visual effects I'd like to think I can help a bit more than normal, but I probably hindered just as much as I helped because you get picky about things that other people probably wouldn't notice.

Do you miss working within visual effects?

Yes! I mean, I would've loved to have had more direct contact with the artists and I think maybe from the moment we started we had a release date, there was the studio that had put a flag in the sand and said this is when the film's coming out, and there's something great about that. It motivates everything, it means we can't mess around, we've got to start going up to production, go to where we're filming and start building sets, because otherwise you second-guess yourself. I really wanted the film to happen, so it was really exciting when they announced this date. You work backwards from that date and everything is happening in parallel. You just can't get involved. With the artists I really wanted to, but the reality is that I didn't need to because the facilities were fantastic. They had it down, it was more me just wanting to be part of it than it was that they needed me!

Did you have specific images in mind in regards to how you wanted the film, and the film's various visual effects, to look?

I built up a load of reference imagery that I'd give the crew and they were mainly images from films from the Seventies and Eighties – films that I grew up with. Stylistically, I wanted the film to feel like it had more of a timeless quality to it in that it could have potentially been a film from my childhood in the Eighties, but without people wearing flares and long collars and stuff. It was that style of filmmaking, where they didn't have CGI – they had to be more efficient and more clever with their storytelling and I think we've lost our way a little bit. Sometimes when we get seduced by computer graphics it makes for lazy filmmaking, and so that was the high benchmark.

What visual effects shots do you find most impressive in Godzilla? What should people look forward to?

I'd always try to find a really iconic image, or try to find five or six iconic images that were just really cool within a sequence, and then it was a case of 'how on earth would this make a story' and trying to connect the dots between these points. There are a lot of moments in the film, which visually are images I've always been itching to get out of my system – we're not short on big, epic things that don't quite fit in the screen and tiny little humans. It's all about giving a point of reference to stuff – you're always looking for something that you know the scale of, that tells you that something's massive, and usually that's a human. There are a lot of shots where the camera is with the humans all the way through – it's very rare that there's not something in between us and the creatures that tell you how big the creature is. There aren't many shots where the creature is so big and so far away that there are not recognisable things between us and it to give you a sense of scale.

What would you say were the main challenges you had to overcome in order to create the VFX for Godzilla?

Probably one of the biggest challenges was that you need to know what Godzilla's doing before you can film the foreground plates, but you can't really decide what Godzilla's doing until you cut the scenes together, and so it's this sort of back and forth process. We reconceived a lot of the fight stuff in the post-production process – we had it loosely correct, but we always knew it was going to be something we were going to get to really address when it came to post-production. Probably the hardest part of post was arriving at exactly what was going on in the climax of the movie in terms of his choreography. You sort of discover the movie as you go and you have to try to stay open-minded. I think it's quite painful for everyone because visual effects are best when they're locked early on and you just commit to a certain shot. If you do that all the way, though, you sort of close up opportunities to improve the film, and so I'm really proud of the work everyone's done – I think they've done a fantastic job and I think I've learned a lot if we ever get to do this again.

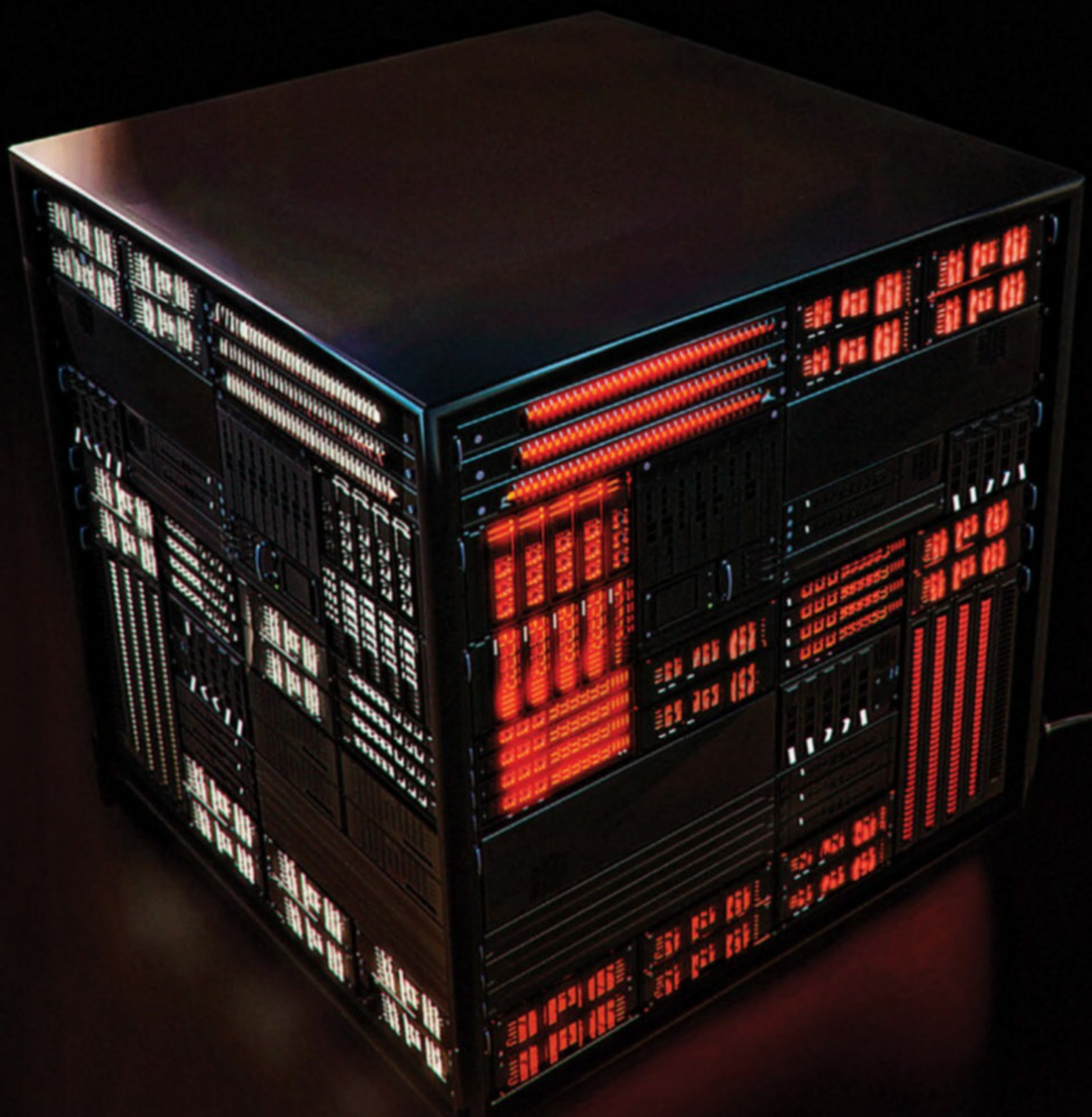
THERE ARE A LOT OF MOMENTS IN THE FILM, WHICH VISUALLY ARE IMAGES I'VE ALWAYS BEEN ITCHING TO GET OUT OF MY SYSTEM

GARETH EDWARDS DIRECTOR

TOP Director Gareth Edwards on the difficulties of coordinating VFX on a Hollywood production schedule: "You have to pull the trigger on VFX shots before you've even started editing, so inevitably shots and sequences come out that people have spent a lot of time on"

MIDDLE Much of the film is shot from the ground-level, relaying the perspective of the human characters in the film. This emphasised the scale of the monsters

BOTTOM Edwards' version of *Godzilla* focuses on the human's perspective of the catastrophe



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TROJAN HORSE WAS A UNICORN

The CG ELITE SPEAK OUT

With the Trojan Horse Was A Unicorn festival just around the corner, there's no better time to ask its speakers what they think of the industry today

Described by Scott Ross as "Burning Man meets TED," the Trojan Horse Was a Unicorn (THU) festival will be taking place in Portugal this September, with some of the biggest names in the industry talking on a variety of issues relevant to digital artists.

Mixing industry insight and artistic inspiration, the real genius of THU is the non-commercial, festival atmosphere that it creates, where industry giants and absolute newcomers can mix together as equals. On top of scheduled seminars by some of the best artists in the world, festival-goers can challenge their heroes to art battles, share a friendly game of football on the beach, take advantage of career-changing recruitment sessions, try out their hand at some life drawing sessions, or simply kick back and enjoy a beer with friends.

There are few other events like it. At THU, the past can be relived, the present chewed over and the future shaped. So along with the sun, sea and sangria, what else can we expect to hear them talk about this year? We sat down with six of THU 2014's speakers – freelancer Andrew Hickinbottom, ILM's Christian Alzmann, MPC's Catherine Mullan, Oscar winner Andy Jones, Digital Domain founder Scott Ross and the legendary concept artist Syd Mead – to learn their thoughts on the industry and where it's heading next.

Christian Alzmann

Andrew Hickinbottom

Andy Jones

Syd Mead

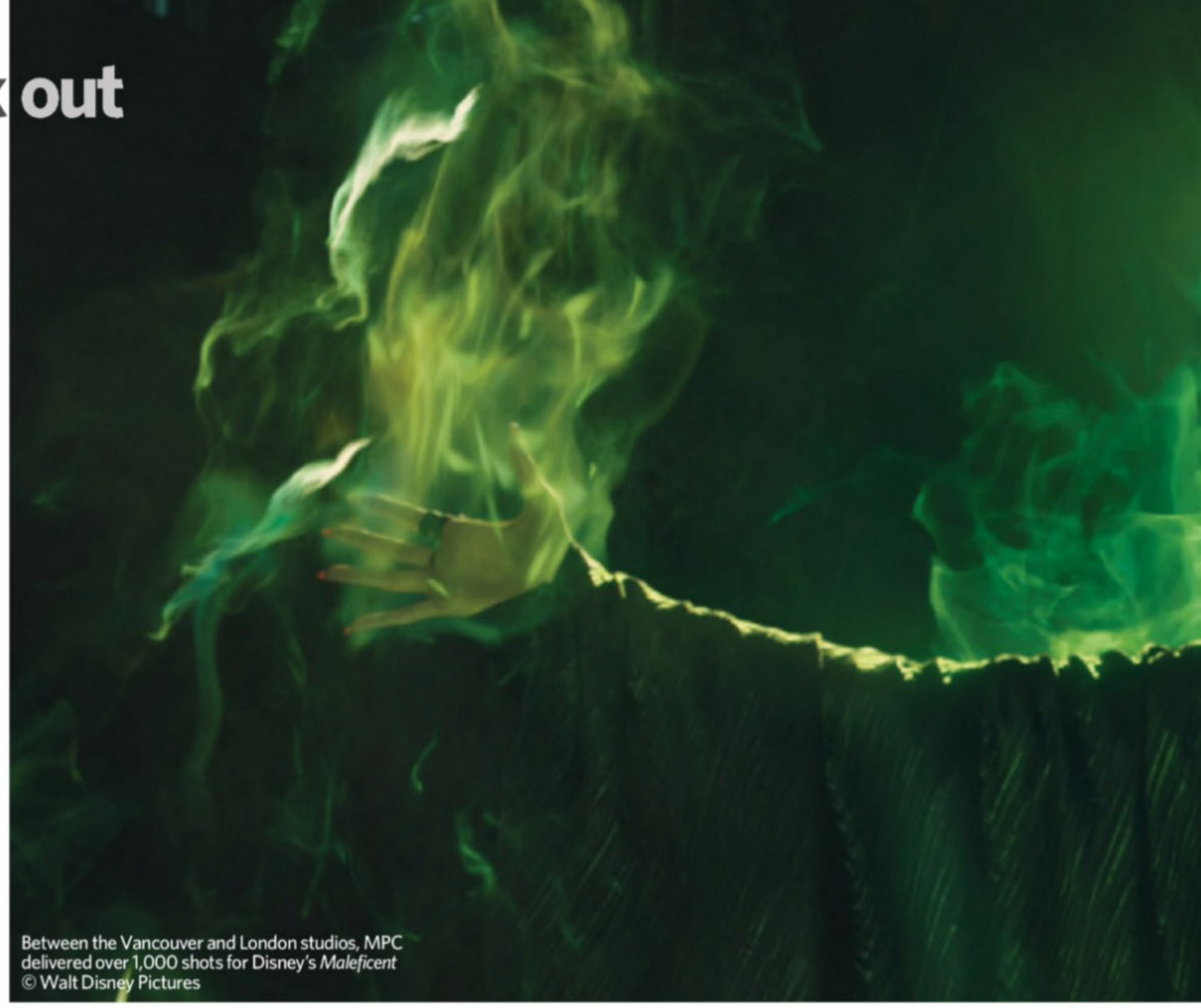
Catherine Mullan

Scott Ross

* TRAINING TALKS

THU combines the feeling of a festival with serious hands-on, creative nuts-and-bolts teaching, and the Gnomon School (**www.gnomonschool.com**) will be leading that charge in 2014. Devon Fay will give a workshop on how to create environments for entertainment, while Louie Tucci will explore digital sculpting in ZBrush, with the focus on newcomers to the program.

The CG elite speak out



Between the Vancouver and London studios, MPC delivered over 1,000 shots for Disney's *Maleficent* © Walt Disney Pictures

Syd Mead
The iconic concept artist talks shop

How has the film industry changed since you first started working in it?

As a general comment on creative endeavour generally, the idea is far more important than the technique. Of course, the tools have changed. That's been the case ever since mankind started scratching images on cave walls. The movie industry is a business, not a missionary effort. Morality, mores and social ethos drive success or failure of entertainment industry releases in both theatrical release as well as in the larger electronic gaming industry.

What do you think the biggest challenges are for the industry?

The biggest change for theatrical release will be spherical, 3D projection. Once you get rid of the proscenium – that defined picture frame – you will no longer be artistically arranging a framed composition, you'll be dealing with a vista – a far more challenging problem in pictorial illustration. It is going to change how directors and art folk think about what and how the story is to be told visually.

Who are your current favourite artists and designers?

Let's start with the dead ones! Maxfield Parrish, lately John Berkey, and classically, Raphael, Vermeer and the French painter, Vuillard.

What advice would you give to somebody who is looking to get into the film, VFX or CG industries today?

The idea always supersedes the technique with any creative endeavour. The industry is looking for the idea process. Always remind yourself that there are a lot of people out there who are as good or even better than you are. The chance for success is the merging of opportunity, timing, personality and whether your idea-generating ability is persuasive enough to get you hired. The formula is approximately skill-set, plus about 30 to 40 per cent luck, and luck was once described by one of the ancient Greek philosophers as opportunity meeting preparation.

What can you tell us about what you're doing at THU this year?

I'll be busy. 3D is simply reality – as in, the world we grow up in. Duplicating the real in reality is a challenging task that technology tries to duplicate to whatever level of accomplishment that is possible. Storytelling is one of mankind's oldest social formats. First, it was for preservation of past experience. Now, the movie experience is to storytelling what the symphony orchestra is to music. To keep the storytelling technique viable, technology enhances the idea with whatever tools are available, both for creating the release format and for exhibiting the result as a public event.

Scott Ross
The former head honcho of Digital Domain reveals all

How healthy is the industry today?

The positive side is that anything that a storyteller and a filmmaker can possibly think of can now be created in *almost* perfect imagery. Pretty soon it will be in perfect imagery. To the average consumer, I think it is perfect. For those of us who have more trained eyes, it's easier for us to tell, but it's pretty amazing what can be done. From natural phenomena to computer-generated people and creatures, almost everything can be done.

What are the big challenges for film VFX in the coming years?

Over the last five or so years, they've started to realise that the international box office is a much larger part of the box office, from the US perspective, and therefore they need to have films that attract international viewers. So what's the best way to get people into the movie theatres? It's visual effects. It has become the most critical part of making international blockbuster movies.

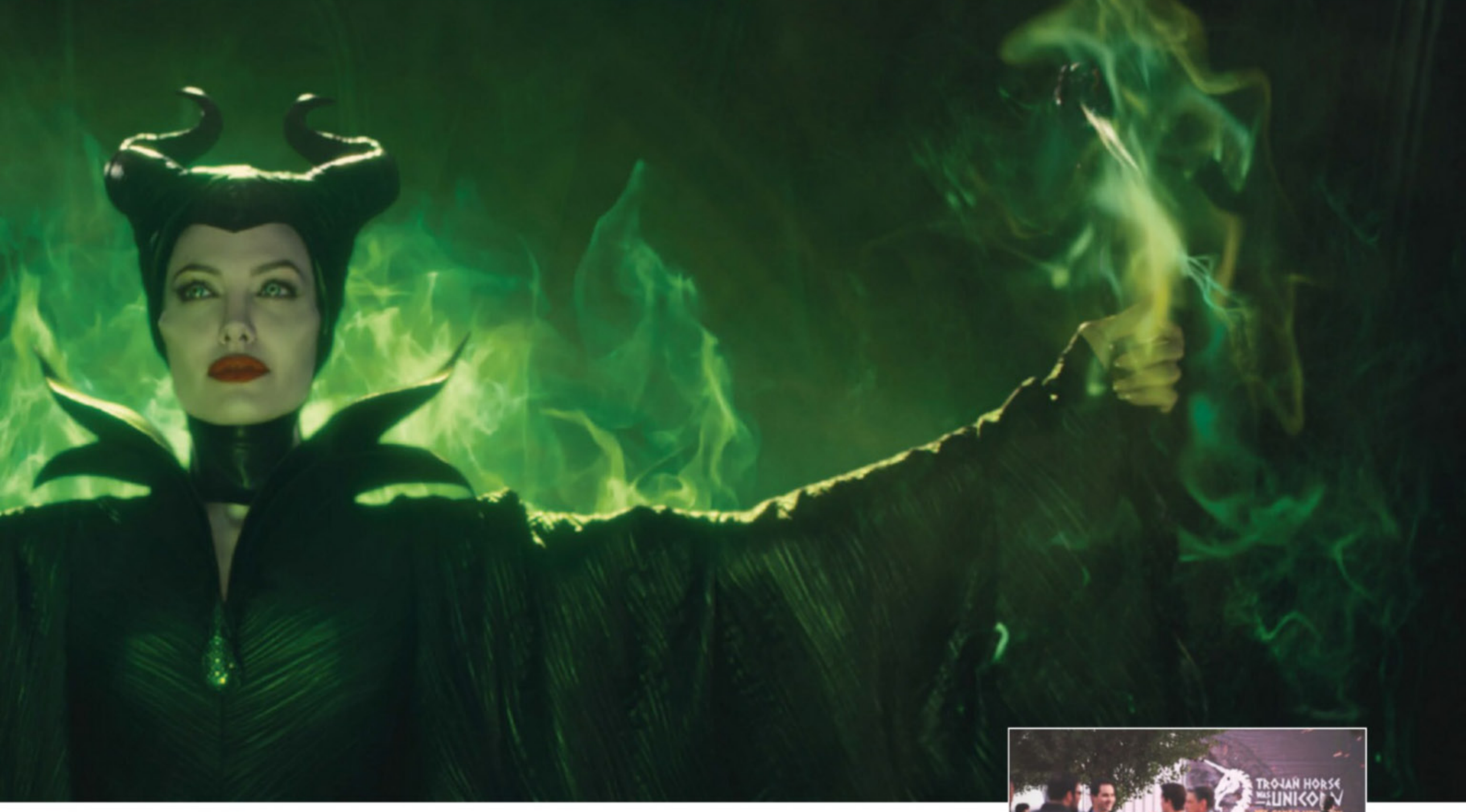
As a result of that, budgets have grown, because creating those effects is very expensive. In my opinion, studios don't have the ability to manage themselves, but they do have the ability to micro-manage the vendor and they have the ability to go out and pressurise people, because after all, there are only six of them, so if you anger one of them you anger all six. So they over-manage the process in terms of price, they don't over-manage in terms of process, because they frankly don't understand it. So they beat you up on price. Right now, for better or for worse – in my opinion, much worse – governments around the world end up subsidising major studio movies. They force production – or post-production, in this case – into countries around the world with the best tax rebates and the best subsidies.

As a result, this small group of men and women who can do all of this work become an international set of digital gypsies that travel around the planet, moving from London to Beijing and then moving again to Vancouver and moving once more to Montreal. The biggest challenge is how do you raise a family, how do you keep a marriage intact, how do you get your kids education when you have no home? So from the perspective of the visual effects artist, for that top 10 to 15 per cent, you live in hotel rooms around the world as opposed to producers and directors who do it for a short period of time and then, if they're lucky, make a fortune. The unfortunate thing for these workers is that while they're highly paid, they don't have the benefits package and they don't have the money that a top director might make. They're running around the world, their marriages are falling apart and their kids aren't seeing them – that's the biggest challenge that faces the industry in the next five years. How do we deal with the talent base and make sure that they are treated reasonably so that they have some kind of semblance of a life?

Christian Alzmann
ILM's senior art director gives us his thoughts

How has the industry changed since you started out?

When I started, 95 per cent of concept art was still done with pencils, markers and paint. I was a trained as a traditional artist using oils, acrylics and



other physical mediums. Within my first year of work at ILM everyone was starting to use Photoshop and Painter. At that point I had to learn how to use a computer and I'm still learning 15 years later. Much of my professional work starts with 3D now. 2D painting is almost considered old school in the film business, let alone using real media. I think as digital artists we will always be chasing the software and trying to learn the next best thing. When I started out, visual effects were still about 60 per cent practical. Most shots had some part of them that used non-CG elements. While the majority of what we do now is digital and there's so much more we can do digitally now as opposed to 15 years ago, it's still all about using the best technique to get the best results. *The Lone Ranger* and *Pacific Rim* both had miniature shots and practical effects elements in them.

What are the big challenges facing the industry?

On the creative side of things I think we're at the point where big effects aren't that rare anymore and everyone expects to see them when they go to a summer film. For me, bigger and bigger isn't the new frontier anymore. It seems like there will always be this quest to make a convincing digital human work at some point, but beyond that I think the new frontier is coming up with cutting-edge ideas and finding new ways to use effects in unique and creative ways to tell stories differently than films were able to 15 years ago. Technique is very important, but it's the ideas and the story that make films winners in the long run.

As technology continues to improve, do you think we'll see more 3D hobbyists emerge, as we saw with Photoshop?

I think we're already seeing the beginnings of 3D hobbyists starting to emerge in the VFX industry. You can learn anything you need to know online and improve by creating your own personal projects. When I visit the different online CG forums it's startling at how high the level of artistry is on them. Many of those artists probably aren't working professionally and probably didn't even go to a big art school, but they are creating beautiful things anyway. I really think that it's because of the changes in software over the last five to ten years. Software has become a lot less technical and much more artist-friendly, so people aren't so shy to jump in and learn them. We're also now seeing a new generation of talent that was born and raised in a world of computers. There is no fear there anymore. It's really great to see it.

Catherine Mullan
MPC's animation supervisor speaks out

From your perspective, how has the industry changed since you started?

When I started working in visual effects in 2001, the industry was still relatively new. The changes since then have been massive – the technology has advanced incredibly, enabling the boundaries of possibility to be pushed each year. The demand has skyrocketed, with the majority of blockbuster movies using VFX to tell their stories. The work being created is breathtaking.

Animation has seen huge developments in rigging, giving us very subtle control. Realism in muscle dynamics, fur simulation and so on, which were not possible when I started out, all add to the beauty and believability of a character. However it's

The Trojan Horse Was A Unicorn festival is being held in Troia in Portugal from 17-20 September 2014, with tickets being sold at €450

* FREELANCER ANDREW HICKINBOTTOM ON HIS CG JOURNEY

"I began my work in the 3D industry a long time ago, back in the late Nineties, and it has changed a lot since then. The artform has exploded in popularity and as the need increases and more people learn 3D CG, the market has become extremely competitive and saturated to a point where it is much harder to stand out from the crowd and impress than it used to be. At THU I will be giving talks, showing my work and explaining my character creation processes."

The CG elite speak out

fair to say that the animation principles remain the same and we strive as we did back then to sell our characters through their performance.

In your opinion, what are the big challenges for the industry?

With each newly awarded project comes a new challenge. Movies are no longer held back by what is possible, only by the imagination of the filmmakers, and VFX allows the most fantastical of visions to become a reality. However, as exciting as these advances are, the projects can often be demanding. I believe that our biggest challenges will be meeting these expectations on smaller budgets and tighter time frames.

How is the VFX industry faring financially?

Since the 2013 Oscars there has been an increase in awareness of VFX and the extent that it is used in film. The issues and concerns raised were many and working in VFX isn't an easy path. I don't know if that will change. The work is not constant and people often have to travel to find a job. However, it's important to say it's not all doom and gloom. I've been very fortunate in my career as I've always had steady work with MPC on some great movies and have been very excited to take up opportunities abroad. MPC Film have studios in London, Vancouver, Bangalore and Montreal and a pre-vis studio in Los Angeles.

What can you tell us about what you're doing at THU this year?

I'm going to talk about the animation from Disney's *Maleficent*. Between the Vancouver and London studios, MPC delivered more than 1,000 shots. I was the animation supervisor for the work in London, which involved bringing a variety of characters and creatures to life. I plan to share my experience on the show, to give the audience an insight into how the work was created, as well as some of the challenges encountered along the way.

Andy Jones
The Oscar-winning animator talks turkey

From your perspective, how has the industry at large changed since you first started working in it?

Both technology and artistry have raised the bar substantially over the years. When I started, large VFX shows were 350 shots. Now you have more than 350 VFX shots in an indie film. Nine out of ten of the top-grossing films of the year are VFX films. People go to the cinema for a spectacle. It is more of a thrill-ride experience than ever before.

What are the big challenges?

Like any industry, the producers want it done cheaper, better and faster. In order for the industry to grow it has to adapt. Unfortunately, the VFX houses that can't adapt will get left behind.

How is the VFX industry faring these days? Have things improved since the financial issues were recognised?

I think it is getting worse. Scott Ross said it best when he said, "It is a race to the bottom." All of these companies and countries are undercutting each other with rebates and tax incentives to get the work. Ultimately it is killing our industry, while the studios funding the movies are getting richer and richer. If the industry were more contained, it would be easy to unionise it so that the VFX industry on the whole does not get taken advantage of. In many of the highest grossing movies, we are the start of the film. I don't know any big movie stars that do not see back-end profits from ticket sales. If VFX houses benefited from back-end deals, our industry would be much healthier.

Speaking creatively, would you say that the film and VFX industries are healthy right now?

Yes and no. Every new film tries to one-up all previous films and you end up getting to a ridiculous place rather quickly. A few of them do it successfully, but most of them fail in my opinion. My suspension of disbelief is halted all too quickly these days. Then there are films that truly impress me and I fall in love with the visual effects industry all over again, such as movies like *Gravity*.

What advice would you have for those looking to get into the industry? What do potential candidates need today?

I think that along with a great reel, new artists and animators getting into the industry should have a ton of ambition and a positive attitude. At the end of the day, you are part of a team that completes the work and often you are spending a lot of time with these people. Along with talent, you have to have great people skills to keep a job in this industry.

What can you tell us about what you're doing at THU this year?

I'm going to be giving a speech about my experiences in visual effects and the state of the industry at the moment. I am really looking forward to Trojan Horse Was A Unicorn – Scott Ross told me about it and it sounds like a great event!

* TOP 10 MOST EXCITING THINGS ABOUT THU

The people who attended in 2013 voted via Facebook to reveal what makes THU such a special event:

1. Free beer
2. Meeting professionals from the biggest film and games studios
3. Making friends for life
4. The fact that it's a life-changing experience
5. Impromptu art battles
6. Beautiful Portugal
7. Improving your skills alongside other like-minded people
8. Inspiring talks from people in the industry
9. Sun, sea and sand
10. Sharing skills and experiences

Andrew Hickinbottom will be at THU festival this year, discussing his character creation process
© Andrew Hickinbottom

As Syd Mead states, the idea is always the most important element when being creative
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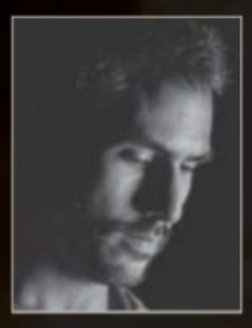

Carlos Vidal Torres

Website http://3dcarlosvidal.artstation.com

Country Spain

Software used ZBrush, 3ds Max, Photoshop

Bio 3D artist specialising in CG character and creature creation

“I started modelling the main character quickly in ZBrush. I like working in 3D from the start as I can see my character from different angles, giving me different ideas and options”

The Golden Boy 2014

My idea for the Trojan Horse Was A Unicorn 2014 Golden Ticket CG Challenge evolved and changed significantly from start to finish. I wanted to tell a story with the image. My main character is the golden boy, the only one who has the golden ticket and can enter Trojan territory without having to hide in the horse. The gates of Paradise are open to him, but on the other hand, it creates envy and enmity. It just goes to show that you can't have everything you want!

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Step by step

Easy-to-follow guides take you from concept to the final render

Artist info

Colie Wertz

Personal portfolio site
www.coliewertz.com
www.facebook.com/ColieWertzDesign

Country USA

Software used Maya, MARI, Photoshop, ZBrush, V-Ray, KeyShot, Procreate

Expertise Colie specialises in hard-surface design, execution, and visual development

The expert guide to hard-surface modelling

paperWasp 2014

> Here we'll look at the creation of a security vehicle from the future, designed to have a bit of grit

Colie Wertz is a freelance concept artist and CG generalist. He is heavily involved in the world of 3D printing

In this project we're going to take a closer look at expert hard-surface modelling and sci-fi spaceship design, with one eye on the possibility of 3D printing at the end.

This project was driven by a number of factors, all of which helped to shape the aesthetic and physical structural design of the vehicle on a number of different levels. My brief was to come up with a ship that met the following criteria: flying fast at camera, unique-looking and wasn't grey. A second, self-imposed driving factor would be to print the vehicle in 3D in colour.

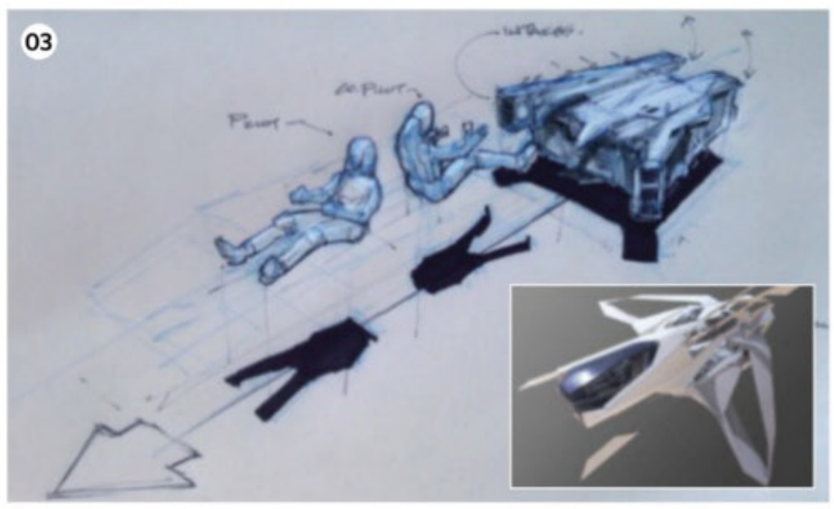
How I approached these simultaneously is what this tutorial focuses on. At the end of this process, I wanted to end up with a viable dual-purpose asset that could function not only in a CG production pipe, but in a 3D printing pipeline as well.

Of greatest importance to me was not letting the 3D print requirements affect or influence the essence of my design in the early stages.

Prepare your design

Decide what design you will create and find references

01 Root your design in reality First, think about your design's story to add to its believability. I wanted a purpose-driven design, so I looked to the near-future evolution of a slightly rough area in San Francisco called the Tenderloin. I'm a big fan of margins – where two things meet there is always some kind of tension. The Tenderloin area is San Francisco's touchstone for this high level of contrast. There's a massive socio-economic disparity between the Tenderloin area and the financial district it sits near. Ferraris roll past the homeless – the hopeless and the wealthy. In my scenario, slums spread across the city floor, while new high-rises spring up as a result of zoning gone awry due to corruption at high levels. Fears of safety spawn private security companies to keep the cultures separate – and so the paperWasp is born.



02 Organise your reference images High volume image organisation can be imposing, so use an organiser like Evernote for my random shots and sites. It allows you to shoot with your phone, upload to organisable folders in the cloud, clear your phone of the photos, and reference those shots at any point as long as you have access to Evernote. You also have the added security of passwords and privacy settings. This way you can keep all of your inspiration in one place, which is handy for the early stages of creation. Since I'm lucky enough to drive through the Tenderloin on my way to work every single day, I didn't hesitate to pull over and snap photos of the vibe my ship would exist in, which could then be uploaded for reference later on.

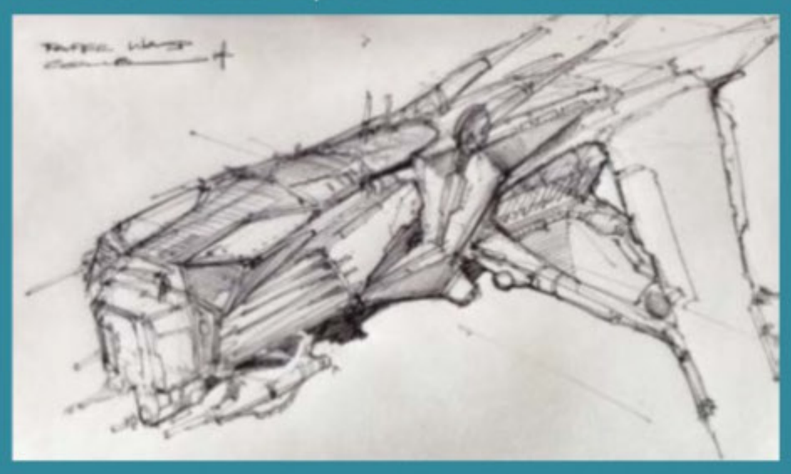
Hard-points

Hard-points are parts of something that won't change, or have some standard attached to them. Take a car, for example. It has an engine that will take up a known amount of space based on what type of engine it is. This means you have to work with this as a given volume, or hard-point. Once you lay out many of your hard-points, you can begin to move these blocks around and sketch over the top of them. Hard-points will make the vehicle more believable in the end, as it makes you question exactly how it would work quite early on in the process.

03 Draw sketches and hard-points Once we've determined the vehicle's need to exist, start sketching and moving quickly into hard-point modelling. Staying in 2D sketching is fantastic, but laying out your hard-points in 3D with some sort of scale is better. We've determined that the engines will be in the back, the size, as well as the width and length of the cockpits. This aids us immeasurably, as even though they are limits, they give you something to spring from. The key here is to stay very loose, but within some framework of believability. We'll chose a Bell UH-1's length as a start for the length. I found it handy to buy a plastic Bell UH-1 kit and keep it on my desk as I could pick it up and remind myself of the scale. It also helped with knowing what size details would look good in 3D print.

Concept

The paperWasp is a near-future version of the Italian Police's Lamborghini Gallardo from a few years ago, only this ship gets action and is private security, not state. I imagined it hiding in plain sight among new buildings in the same way that the way police sit in plain sight on motorways, yet somehow sneak up on you. The ship would need to be able to land on building tops (some vertical thrust) and fit at a minimum down four-lane streets. There would be two seats – a pilot and communication tech.



Learn how to

- ☑ Start a vehicle from scratch
- ☑ Design a realistic scenario for your vehicle
- ☑ Build around hard-points and known limits
- ☑ Think about making your model 3D printable and renderable at the same time
- ☑ Use MARI and Photoshop to get fast maps on your model
- ☑ Use KeyShot to test shapes for shadows and reflections
- ☑ Pick an HDRI that best works for your concept
- ☑ Use your iPad for sketching
- ☑ Render and composite passes for a final image

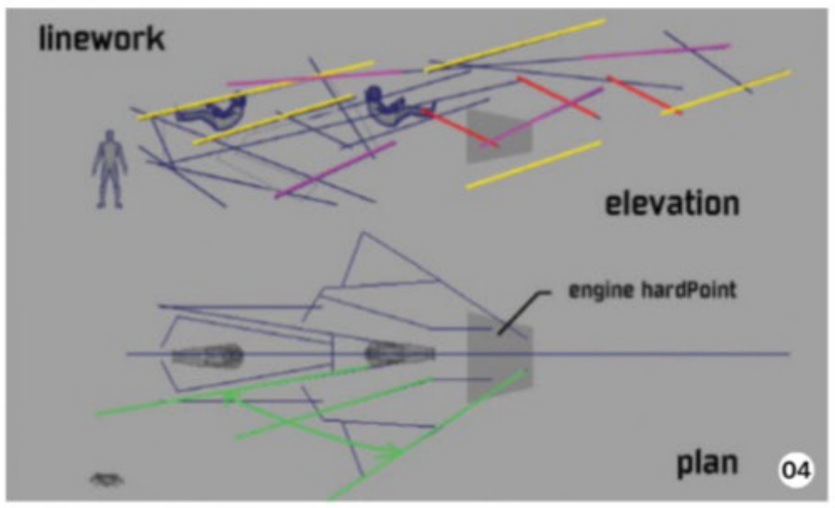
With the Disc

Tutorial files:

- Tutorial images

Add forms and function

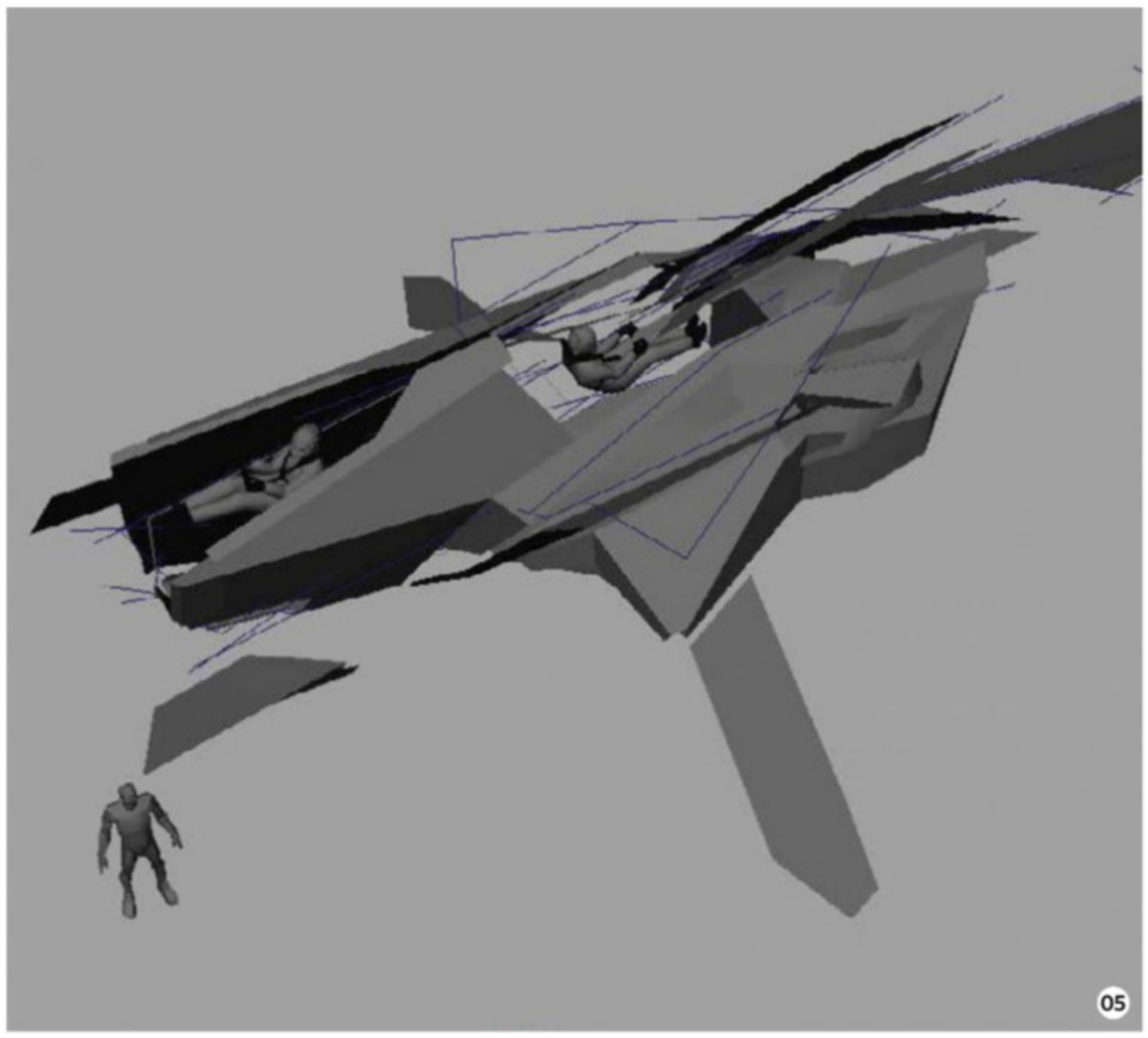
Build on your idea to create a solid base model



04 Use lines With our scale, function, mode of movement and relative date of use determined, we can move forward with our formal push. If you haven't already done it, bring in a scale figure to help you stay true to your design. Do a rough elevation and plan sketch of your design with its hard-points, scale and components to date at this point. Use them as underlays for some quick linework. The linework isn't intended to be final. Your goal here will be to develop simple, but strong linear relationships within the vehicle. Automobiles have them all over the place – you will begin to appreciate even the most poorly designed car once you relate your own linework in different planes. Once you have a number of lines defining your early shapes, you can move them in space, slowly massaging volumes into interesting silhouettes.

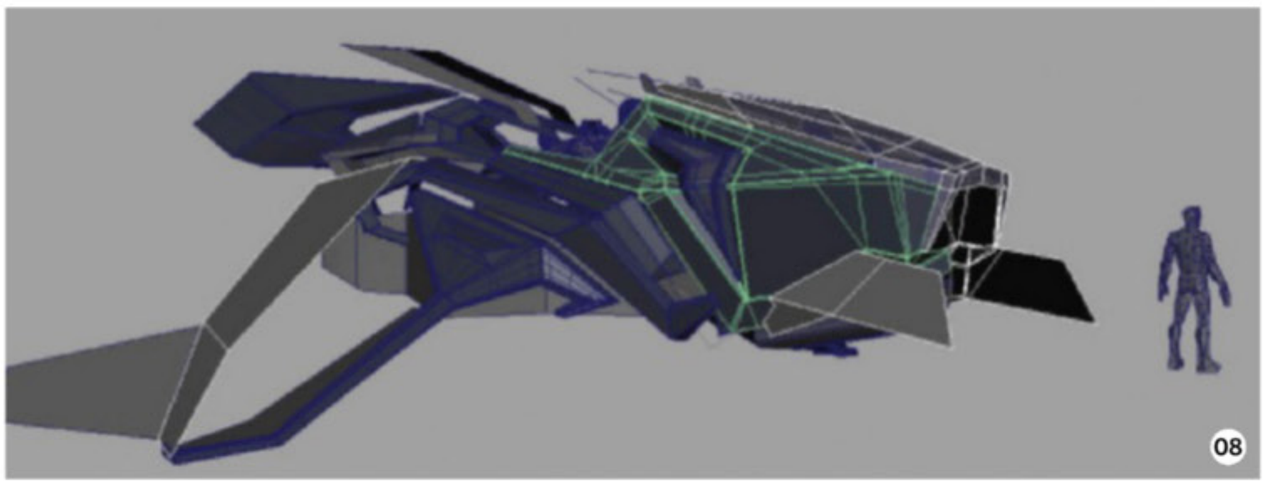
Avoid hitting a wall

It can actually be fun to hit a wall as you throw lines down in the modelling stage. When I do, I simply group all of the lines, duplicate them, flip them around on some axis and proportionally scale them. This never fails to give me some new insight. Because the lines are already existing in their original grouping, they'll have an immediate dialog visually within the whole, so new frameworks may appear. It might even give you some inspiration for graphics. This is one of the examples of letting function and form work together (albeit keeping the intent of the design's use) in a positive, non-linear manner. This is a fantastic time for happy accidents to occur, and the cost is a few degree-1 lines.

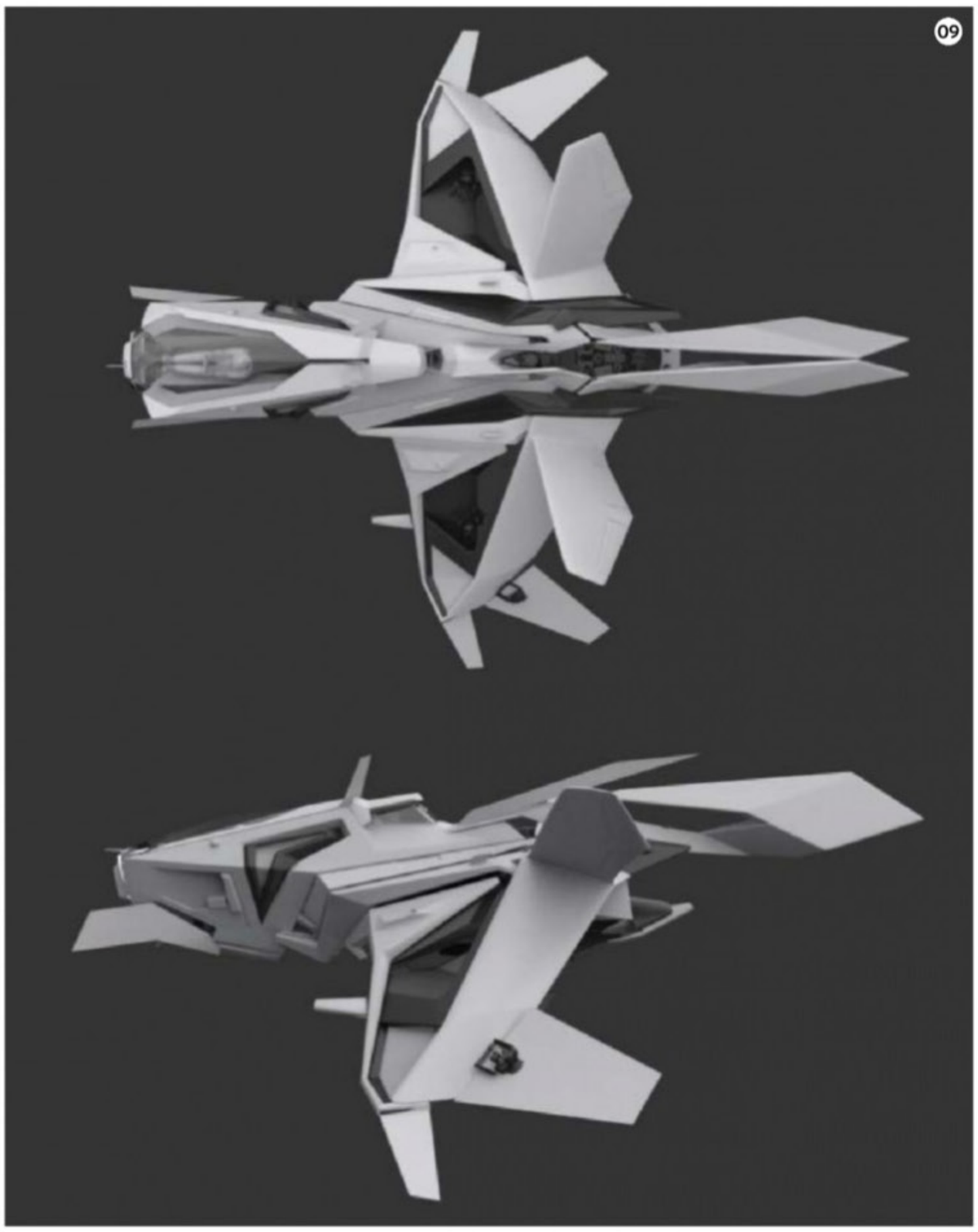


05 Add volume This is where the rubber hits the road in my book. You'll have a feel for your vehicle's attitude once you hit this step. By this I mean that it has a vibe – a Lamborghini Aventador has a vibe that differs from a Fiat 500. The Aventador moves forward in every aspect, even sitting still, while the 500 tends to stay somewhat vertical. The two vehicles have different DNA, even though they do the same thing. Their DNA is brought out in their lines, volumes and how those volumes transition. The paperWasp slopes forward and has forward-swept wings early on, and as you guessed, I'm a big fan of the aggressive lines on the Aventador! However, make sure that you leave room for enhancement and future discoveries as you investigate silhouettes in more than one view. This is still only a concept and just because you start off by being in love with an exotic supercar, it doesn't mean that you'll stay there. The paperWasp is as influenced by the A-10 Warthog, the Abrams tank, and the average dustbin lorry as it is by Italy's unattainable beast. This is because it's a good idea to keep pushing the boundaries – don't just stick to re-creating the first idea that you think of.

06 Try shading early Once all of these simple forms are all lined up in Maya, export them immediately to KeyShot. It's good to see what kind of shadows and reflections even the simplest forms can create in a project as soon as you can. With the ease of material assignments in KeyShot, you can start being informed on what kinds of material might go where to enhance the essence of your vehicle. Not long ago, I would've done all of this at texture time, as I pushed too linearly through my process, but not any more! Be it KeyShot or your modeller's built-in IBL renderer, do this right away. Don't be afraid to mimic KeyShot, either. Personally, I have a group of material shaders for both V-Ray and mental ray that are very similar to many of KeyShot's presets for quick assignment so that I can keep modelling in Maya. MODO has a ton of great shaders, too. Use them early to keep your brain from bogging into a modelling abyss. Always have a number of disciplines running in your head and on your machine.



07 Make use of an iPad This has become my weapon of choice of late in the land of what to do next. Using the iPad coupled with a painting app called Procreate can be vital to the design process. Take a screenshot of your progress and while you're taking a break, sketch any other ideas and thoughts on top of the work. Again, this breaks the linear approach of the past. Use this to try out all of your ideas before you go to the trouble of modelling them. We all know how to model to some degree, but the design is far more important than the actual model. Use your mobile devices to get away from your laptop or your workstation. The example image associated with this step shows the division of the cockpit glass that was sketched on the iPad.



08 Prep your volumes Now that you have done some back-and-forths between your iPad, KeyShot and your modelling software, start committing to some of your ideas. Bevel those edges or insert segments. You're defining the lines and edges of your forms. For the paperWasp, the edges need to be hard, like an Abrams tank or an Aventador, as the engineers and the maintenance crews would be fixing things all the time. At this stage it can be a good idea to take the time to rebuild some of your volumes, adding new changes or preparing them for later stages.

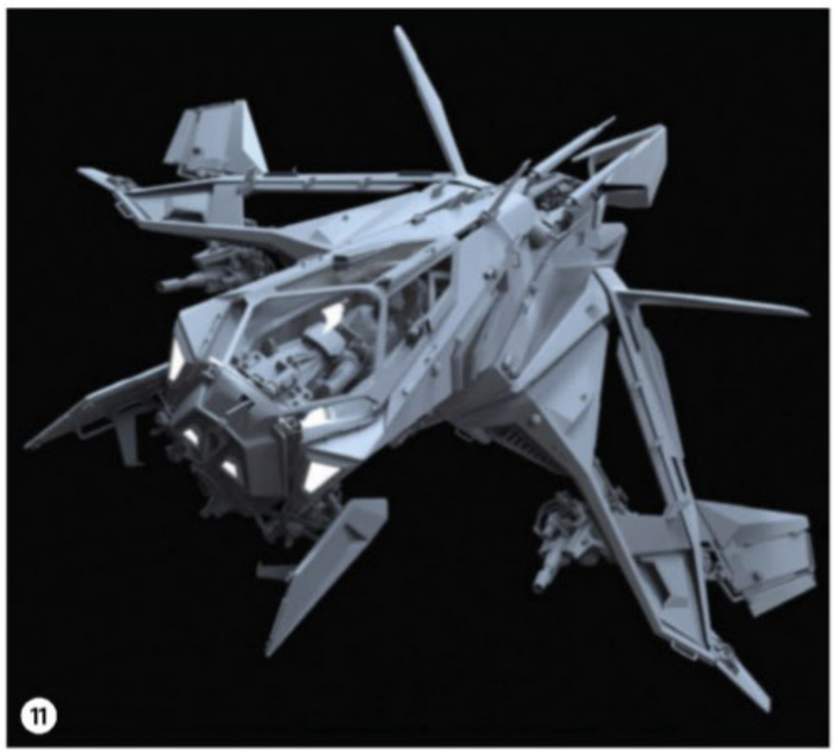
09 Make silhouettes Plump up those volumes in more than one plane. That is to say, as you move your points, do it in multiple views so that you can see how the movement and stance changes on your vehicle. Thankfully, this is cheap, as there is simply no detail in your design yet. Take a few screenshots for your iPad and maybe even throw it in KeyShot, as you'll see opportunities for commitment and interesting transition solutions might occur. This may just be the most fun part of the process; you can really flesh out the design.

10 Kitbash to add detail Saving your old models for later kitbashing can be incredibly useful for when you're working on other projects at a later date – I can't stress how important it is to save your work! For instance, here I dived into my saved bag of extra modelling elements from models past to help kitbash out the paperWasp. I can't stress enough how keeping your older models in your mind's eye is. I have a lot, and try as I might to move into a kitbash database mode, I remember the extra parts in context better. I can, for some reason, remember what went where on what model. So for me, I simply open a big model and copy and paste the parts or parts assemblies into a blank Maya file and then bash some stuff together. Non-proportional scale is your friend, here. This is also where the practical Huey model sitting next to my station came into play. We already know what looks pretty good in CG as far as detail goes, but as I knew that I was going to 3D print the paperWasp, I decided on a size of print relative to the Huey model and added detail of that scale, too.

UV and paint the model

Start the texturing process

11 Save your work Once you have your model in a great spot, rename it as a new version, showing that it's done in the file name. Keep it low-res, or un-smoothed, despite it being done. It is from here that file organisation is absolutely paramount. You will be going back and forth from Maya to MARI to Photoshop a lot, so spending the time to set things up in a file structure that you can consistently trust and recognise is really important at this stage.

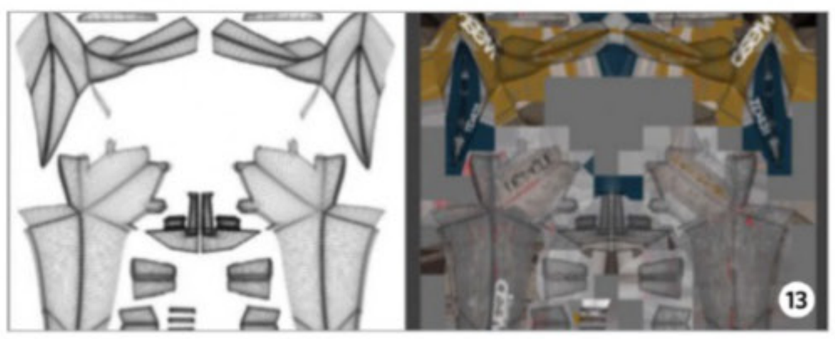


12 Begin with UVs Start by GoZing the big parts. GoZ sends a part from Maya to ZBrush. Unwrap in ZBrush with UV Master and send the part back to Maya via GoZ. Arrange those UVs on the UV grid and try to send similar-material parts to the same grid so that the shader and any corresponding mattes and maps can all be used in a more closed UV environment. It'll save some time down the road. Assign a Lambert shader with a UV diagnosis grid to each UV tile and name it accordingly (for example: uv1004_DIFF_01.jpg). This tells us that this tile lives in u=3-4, v0-1. Refer to the shaders and files this way from here out, in MARI and in Photoshop. Depending on your project and subject matter, you may want to let certain tags (like UDIM) let MARI name the maps for you. It's up to your preference. Once all of the UVs are done to a point, bake smooth the model and save it with a 4Mari in the name. This keeps the low-res and high-res models referring to the same maps. Finally save out an OBJ to MARI.

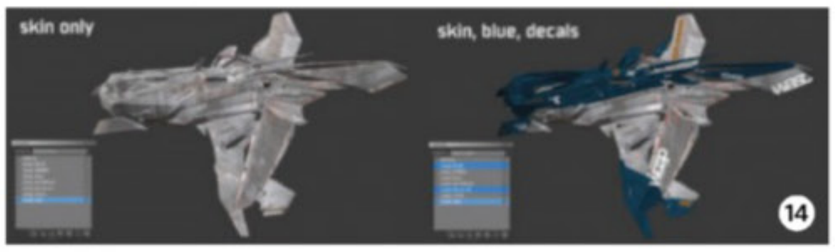
The versatility of MARI

It's hard to express how valuable MARI can be. It changed my concept approach to better prepare and execute my models for quick use inside CG pipelines. Its multiple resolution maps over patches have been invaluable and the ability to generate quick, accurate paint jobs via its Projectors and Stamping tools is a must for concept-to-CG pipeline flow. I can get a long way toward a paintover quality image with a few Blending modes and dirt maps. With proper planning, I can use early concept maps as pre-existing underlays that move into final production maps simply by adding new layers with higher detail all in the same file.

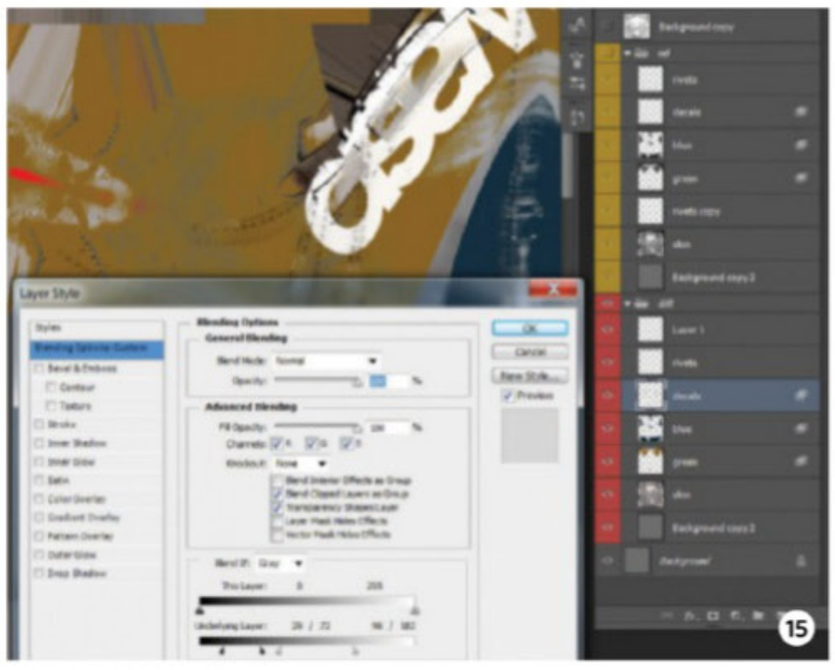
13 Use MARI and Photoshop Take snapshots of all the UV grids in Maya and save out a master file. Feel free to go into Photoshop to make small adjustments to the maps and to make use of the layer blending modes. Have all of the maps in this master file, even though it lives in MARI, too. My file would be named "uv1001_MASTER_01.psd". Put your snapshot on top and screen it over everything below. We now have connectivity to Maya and MARI.



14 Set up a MARI Workflow So now we have UVs and know what we're going to paint. Make a layer for the Diffuse pass and get going. The base is usually the skin, which in this case is aluminium aircraft skin. Rivets and odd panels work well together as a starting point. Try to put panels where they'd be on a real aircraft, as it'll sell the realism. Personally I tend to have two or three different 3k images imported into my images for stamping. Once that's done, set up projectors for the big graphic patches and bounce 4k images back and forth to Photoshop for better Bezier paths. Don't get too into the chipping – just get them on there. Next, make a layer for decals, which we'll keep on a sheet of stamps. I keep a few on Google Drive, so all I had to do was make a PNG with all the decals on it, then move that sheet. The "Wasp" text was the same. I built it in Photoshop and brought it into MARI as a stamp, and then made a layer for rivets. A PNG of rivets stamping along edges and seams is a phenomenal seller and is very easy to do in MARI. Once complete, these layers should be exported individually and brought into the master Photoshop file, where you could take advantage of Photoshop's Blending tools.



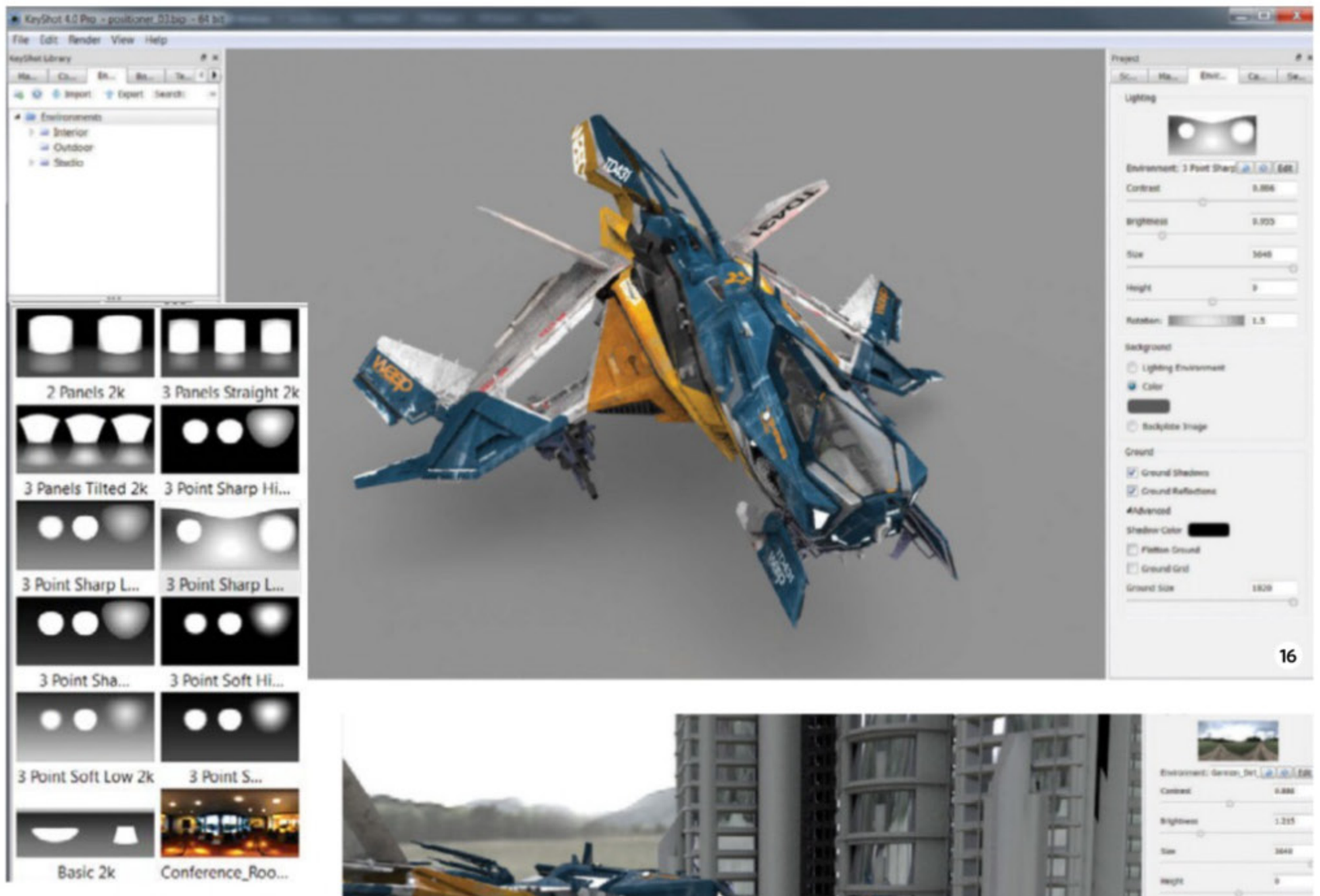
15 Tweak in Photoshop Using Photoshop to edit files is a good way to ensure they'll fit in with your subject. Set up a painted MARI-to-Photoshop layer so that the base texture of the aluminium skin can disrupt and marry all of the other layers together by going to Layer Style>Blending Options. Once you find a look you're happy with, bake it then reapply the baked texture in MARI, add chips and then export back to Photoshop for mattes and masks in the Reflection pass. This small bit of back-and-forth can be more or less accomplished completely inside MARI, but because we're trying to get things in the lighting environment in KeyShot as fast as possible, we shouldn't become overly dependent on MARI. By playing in Photoshop you may find something that you wouldn't have caught in MARI, as you would've been aiming for it. Again, keep as many disciplines going at once as you can and you'll keep getting good results.

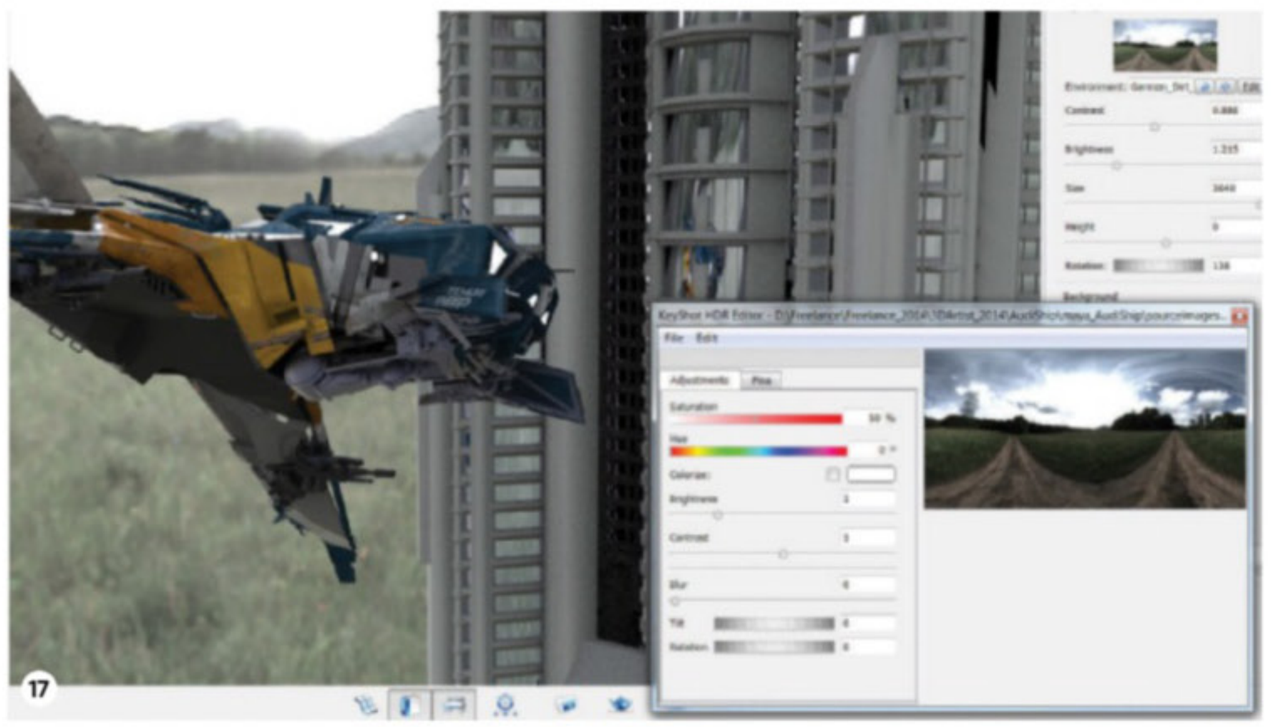


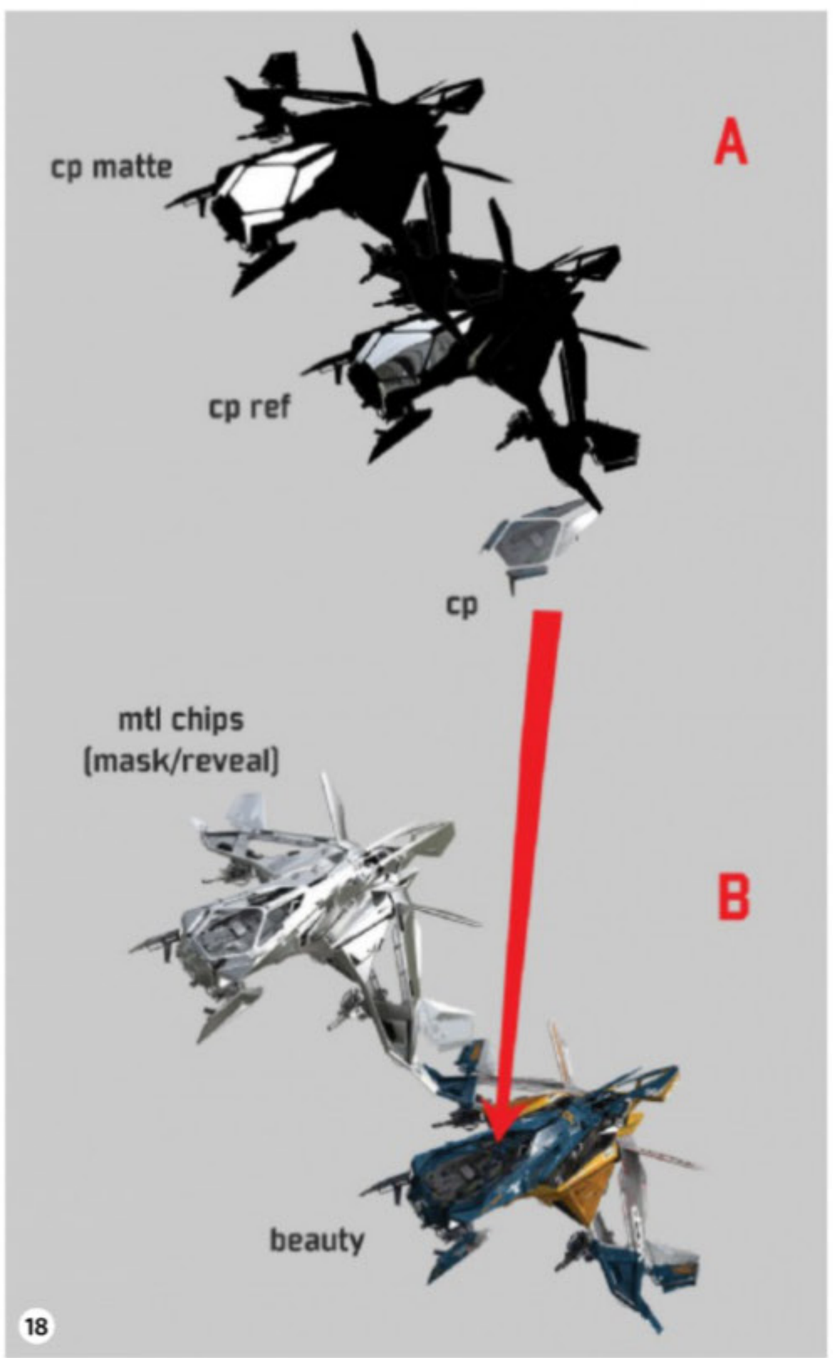
Render and comp

Finalise the look of the CG artwork

16 Make rendering decisions With the layers we've developed in MARI and the different blending we were able to do in Photoshop, you should be comfortable in getting some decent Reflection maps. These two maps alone get us a long way in making decisions for our next move. To save time and push ahead, go into KeyShot – you should find that you can get far enough with these two maps for the final piece. It's worth noting that for a concept piece, KeyShot is fantastic, but I wouldn't do visual development in it. V-Ray or mental ray would be better, as the shaders are far more robust, and you'll always learn more about materials. It also feeds the model directly into a more standard CG pipeline.







17 Pick an HDRI Because the ship needs to be in a city environment, but in the air, choose an HDRI with a strong directional key in KeyShot. This pasture HDRI is good, so go into its settings and adjust the Brightness, Contrast and so on to create an image that won't contaminate the colours too much. Ideally, get a city HDRI. To compensate, add a foreground building to reflect in the cockpit glass and obscure a bit of the key. Personally I'm accustomed to a lot of control in V-Ray surrounding Fresnel and Refcolor due to the scratchbuilt techniques I've learned in the past. While KeyShot doesn't have this degree of control yet, we can fake it with proper passes and some painting in the comp. Sometimes I find that I get hung up because I'm thinking of it in a CG pipeline instead of concept art. KeyShot's speed and feedback will get us far for concept art and we'll learn to let the concept push the vis-dev, which is a more fun way to play.

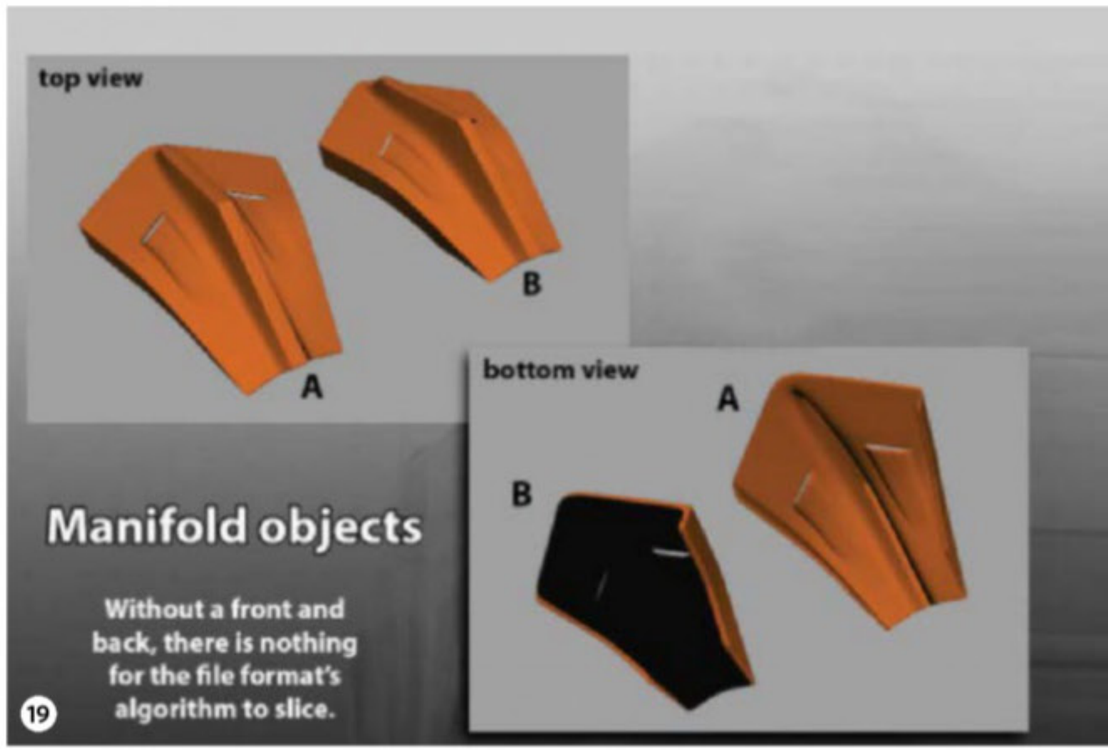
18 Create render passes Lock a camera down in KeyShot that fits your purpose and get a good feel for what angle will look best. Next, run a number of passes by replacing materials on the model. The passes are beyond basic, so I won't try to explain them too much. There are a million ways to get the look you want via each renderer, but KeyShot cuts that number down significantly. At 4k, the renders will only take a few minutes each – I had twenty 4k maps on my model! Render PNGs with transparency for easy compositing in Photoshop. Overlay your passes, get a good look going, apply the chips and dirt freehand, then composite the ship over a photographed background and adjust it. Add a little motion blur on the background for good luck and your paperWasp should be ready for patrol!

3D print the model

Bring your model into the real world

19 Set a manifold geometry For an object to be printable, it needs to have manifold geometry. The impact of this requirement is that you can't get away with just building the front of things. Deciding not to build the back of something because it won't be seen doesn't work for print because the files you export for print slice your model into lots of sections, defining the volume per slice. With no volume per part, it can't slice. The qualifications for non-manifold are more comprehensive than that, so it's worth doing some research to find out exactly what those qualifications are and making yourself adhere to those guidelines. In Maya, you can run a diagnostic on your model by going to Mesh>Cleanup. Note that Displacement, Bump, or any other surface altering technique you're accustomed to faking in CG for renders needs to be baked into the geometry's final mesh. The printers need hard geometry.

20 ColorJet printing In this case, we'll be sending the paperWasp through a 3DSystems ProJet 660 Color Jet printer. This printer, formerly known as a ZPrinter, produces a full-colour print using gypsum powder cured by a bonding agent mixed with ink. It does so by an armature deploying a 0.1mm gypsum dust layer on a printbed in part one of a cycle, then curing that layer with a light bonding agent and ink in the second part of the cycle. The print bed drops 0.1mm and the cycle begins again until the sectioned model is finished.



21 Maya To ProJet Remember that smoothed Maya model with all the textures being referenced in an earlier step? This is where it comes in handy. Use basic Lambert shaders with Diffuse maps only. Save it as an OBJ with materials. Use a scale that will fit on the printbed of the printer. Model in 1 Maya unit = 1cm. We could go 1 Maya unit = 1mm, but for a ship this size, it gets a bit large, so stay in centimetres. V-Ray likes 1 Maya unit = 1cm too, so try and babysit the likes of all your software as much as you can. That way you're prepared to offer the model in CG or for printing. Again, this comes from just taking the time to set up some simple parameters early on. Save out an STL and you're good to go.

22 Print and clean The time it takes to print is dependent on the height of the model, and not the complexity, which is one of 3D-printing's biggest advantages over conventional manufacturing methods. This model took a little over four hours to print. I've been doing this for a while now and still consider that impressive. Once the print is done, get rid of any extra dust with a vacuum – it's not unlike unwrapping a gift. With luck, the gift hasn't broken due to you excavating it! With a delicate model like this, it's worth taking your time. Once free of dust, the model is further infiltrated via an agent that makes the object watertight as well as more saturated in colour. Let your model dry on a little rack and two hours later you'll have your model – it feels a lot like rendering!

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

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I made this...

Incredible 3D artists take us behind their artwork

Artist info

Daniel Rybkin

Website https://vimeo.com/user1076787

Country Belarus

Software used 3ds Max, V-Ray, mental ray, Photoshop

Bio Daniel studied at the Belarusian State Academy of Arts

Submarine Interior 2013

This was a commercial work, with the task being to create the interior of a submarine. I really enjoyed this project as it gave me the opportunity to create a large number of details, while also working on interesting lighting and complex metal shaders.

> “Small details are important. When creating something photoreal I add as many as possible. Some dirt in the corners and crevices using the V-Ray dirt shader can help with this”

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Artist info

Uli Staiger

Personal portfolio site www.dielichtgestalten.de

Country Germany

Software used CINEMA 4D R15, Photoshop

Expertise Professional 3D artist specialising in the creation of big, dramatic scenes

“Here we will learn how to create exciting CINEMA 4D scenes, and then composite them into interesting background plates using the features in Photoshop”

Uli Staiger is a photographer, 3D artist and the author of many books and video tutorials

In this tutorial we will create a dramatic scene, playing with the combination of a photographed background image and a modelled 3D scene. The modelling of the submarine tower will be completed with classic box modelling, and we will see how hundreds of rivets can add realism to the hull without straining your RAM. Sculpting is a great method to add dents to the front with just a few clicks. The rendering of the scene will prepare it for post-production in Photoshop, as it will ensure all the Alpha channels needed are ready. We will work with different composition tags to organise the scene in terms of visibility of sections and the use of Alpha channels in Photoshop.

With the Disc

Tutorial files:

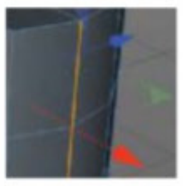
- Textures and images
- Tutorial screenshots

Concept

This image is one of pure fantasy and fits into a series of similarly themed works that I have created. Like in this scene, most of the other imaginary situations are also set in Germany.

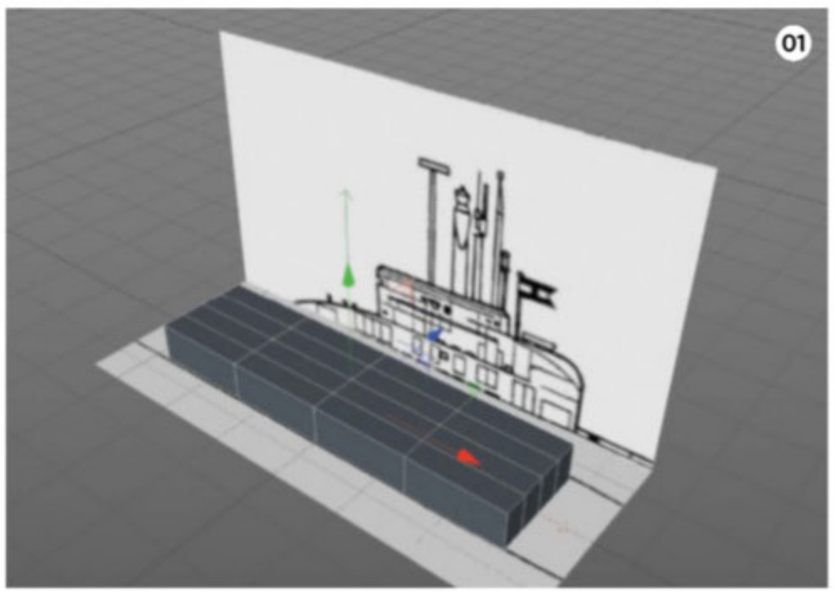
Learn how to

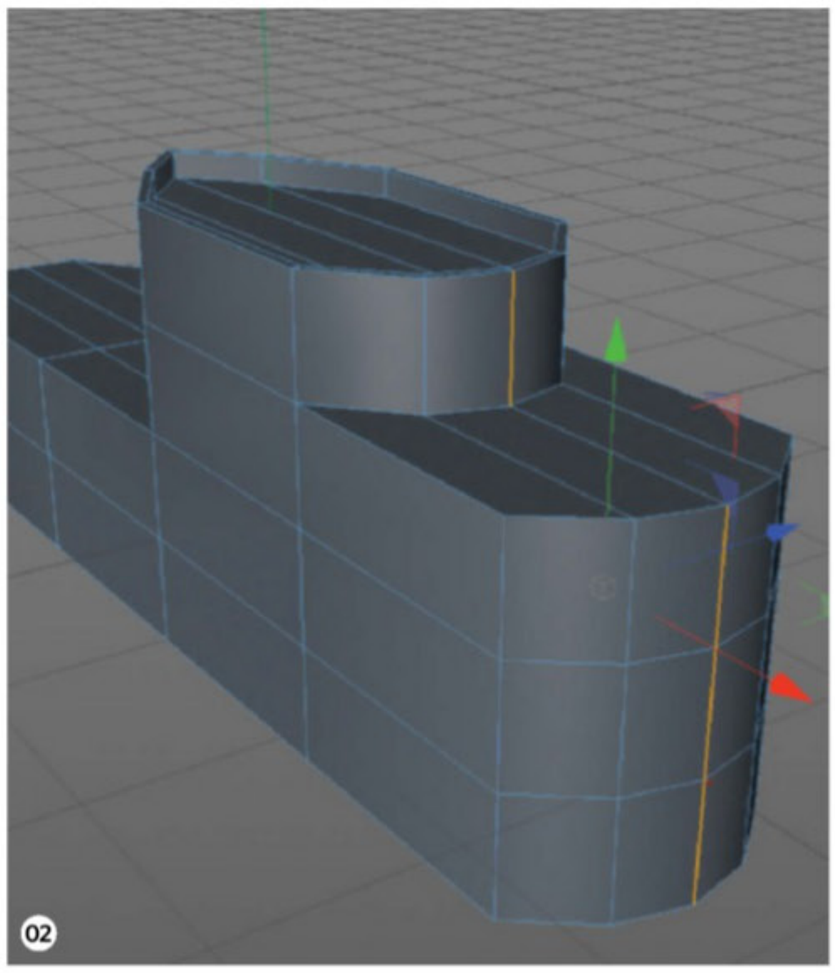
- ☑ Create correct proportions
- ☑ Use the SDS Object and the Knife tool
- ☑ Create rivets and align them along your object
- ☑ Use the MoGraph Cloner Object
- ☑ Use the Sculpting mode in CINEMA 4D
- ☑ Create simple materials and use PSD files



Create the main shape

Work on the tower hull using classic box modelling

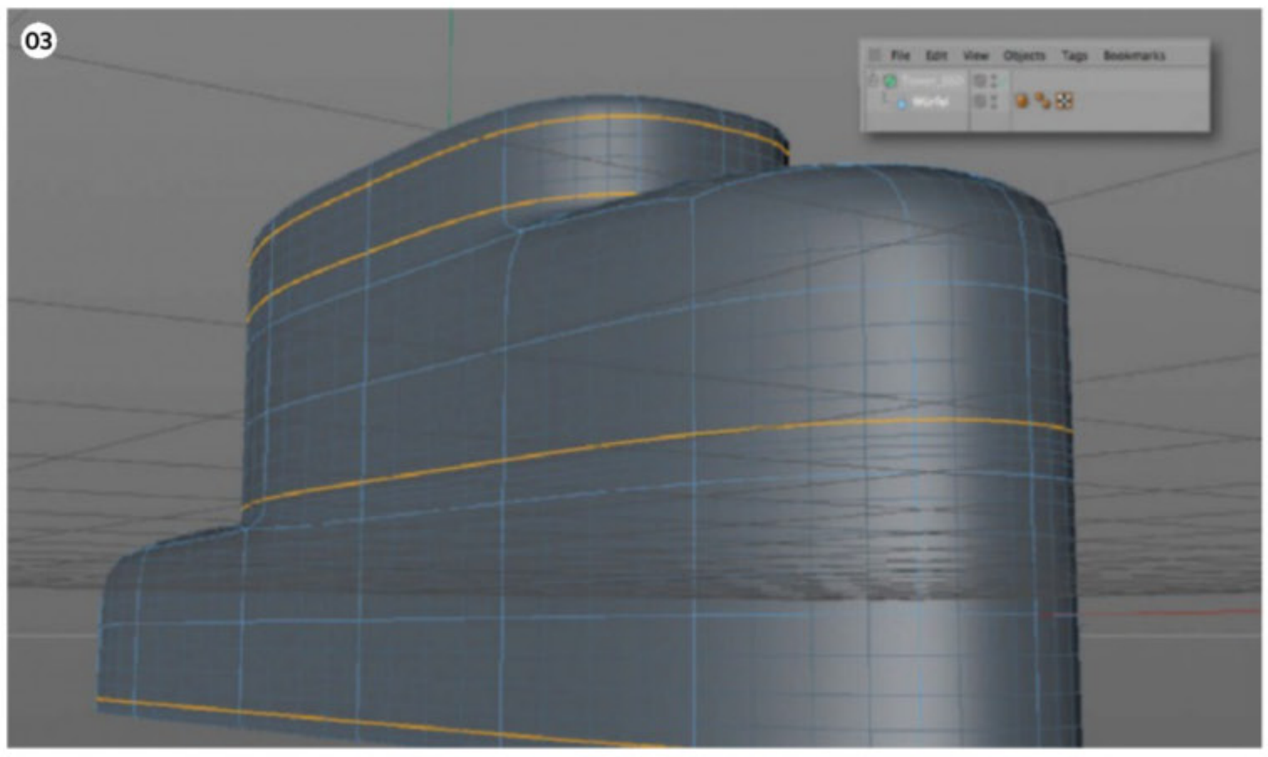




01 Achieve the correct size Although the scale of the tower is not relevant, the proportions of the length and the height are. Create a cube with X set to 880cm, Y set to 670cm and Z set to 440cm. Take off four of the six surfaces and map plan_front_view.jpg and plan_top_view.jpg onto the remaining two faces. Start creating the tower with a new cuboid, making sure that all the measurements fit the plan. Give it four sections in the X- and Z-direction.

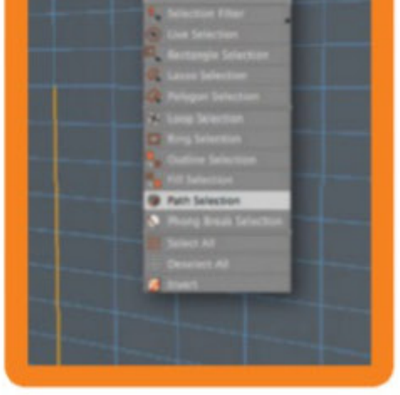
02 Extrusion After conversion to a polygon model execute one extrusion of 100cm, then select just the front-top part polygons and extrude another 100cm. Select the rear part of that last extrusion and once again extrude 100cm. Make sure that you are in Polygon mode, then select the six front polygons and pull them towards X to achieve a rounder shape. To refine the shape, go to the Edge mode and pull the three centre edges into the X direction as well.

03 SDS Object Create a new SDS Object, formerly known as HyperNURBS Object, and child the tower to it. Now you have two options to reduce the rounding. Either select the four indicated loops and bevel them slightly, or use the Knife tool in Loop mode and set four loop cuts near the indicated edges. Both techniques reduce the strong effect of the SDS Object near the edges. Ensure that there is no active edge selection before using the Knife tool.



Path Selection tool

Sometimes, especially when it comes to a very fine, subdivided mesh, you can simply use the Path Selection tool, which can be found under Select>Path Selection. You will see that it is a lot easier to use than the Live Selection tool because the Path Selection tries to anticipate the selection you plan – just make sure that you're in Edge Mode.

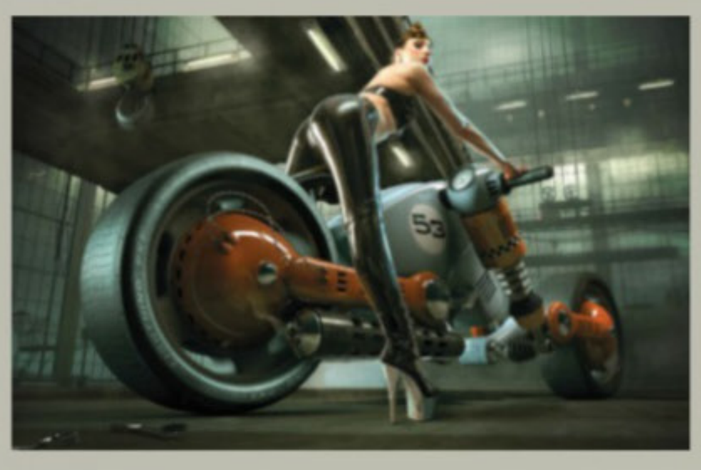


Artist showcase

Uli Staiger

Uli started out as a photographer in 1987. After working as a freelance assistant in New York and New Jersey, he then chose to move back to Germany. While studying for his Masters, he discovered Photoshop and shortly after that he combined it with CINEMA 4D. Uli is 47 years old and currently lives in Berlin, Germany.

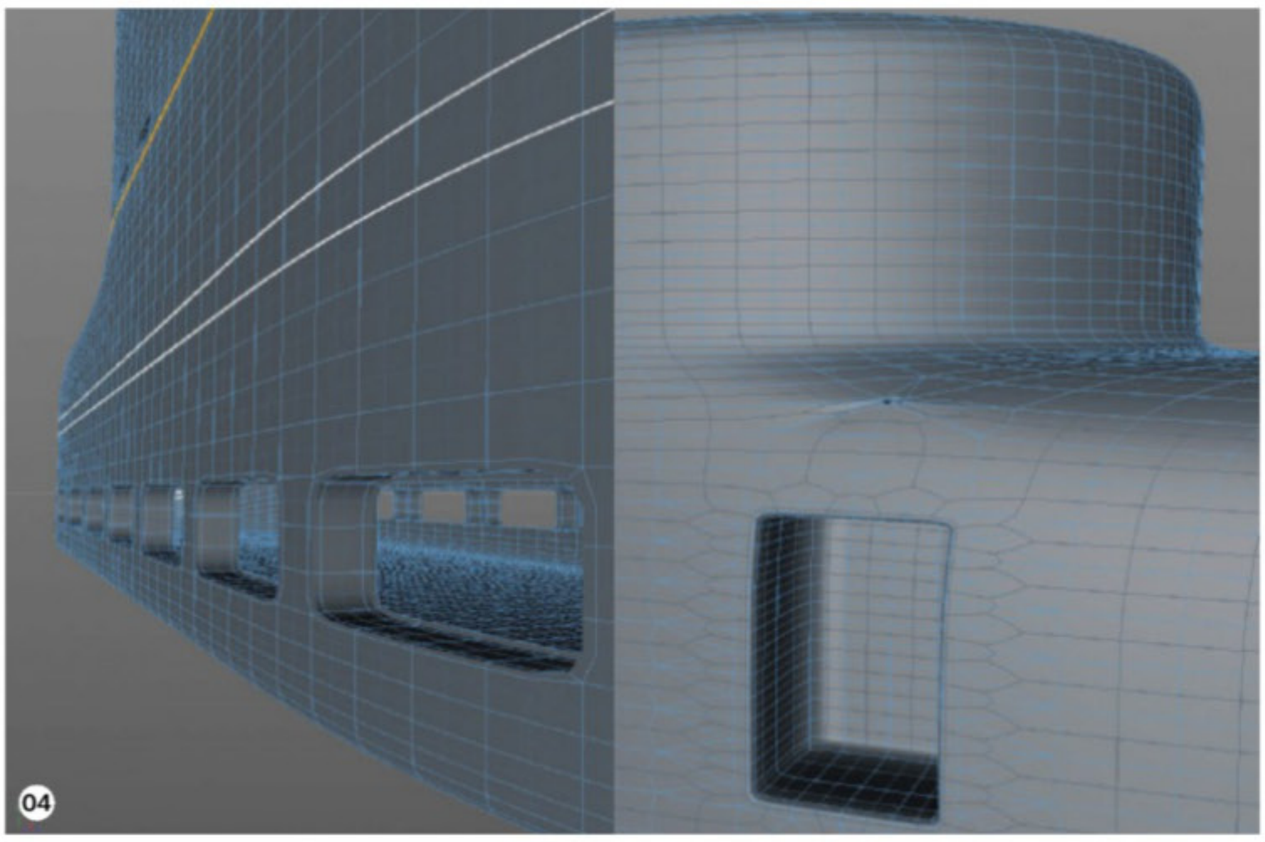
Luftschiffer **CINEMA 4D, Photoshop (2011)**
This is a steampunk image showing a future that never will occur, as well as a past that has never occurred. It combines photography and CINEMA 4D modelling.



Sinteque **CINEMA 4D, Photoshop (2012)**
The motorcycle was rendered in CINEMA 4D, inspired by the German designer Daniel Simon. The hall was modelled, but the model Sinteque was photographed.

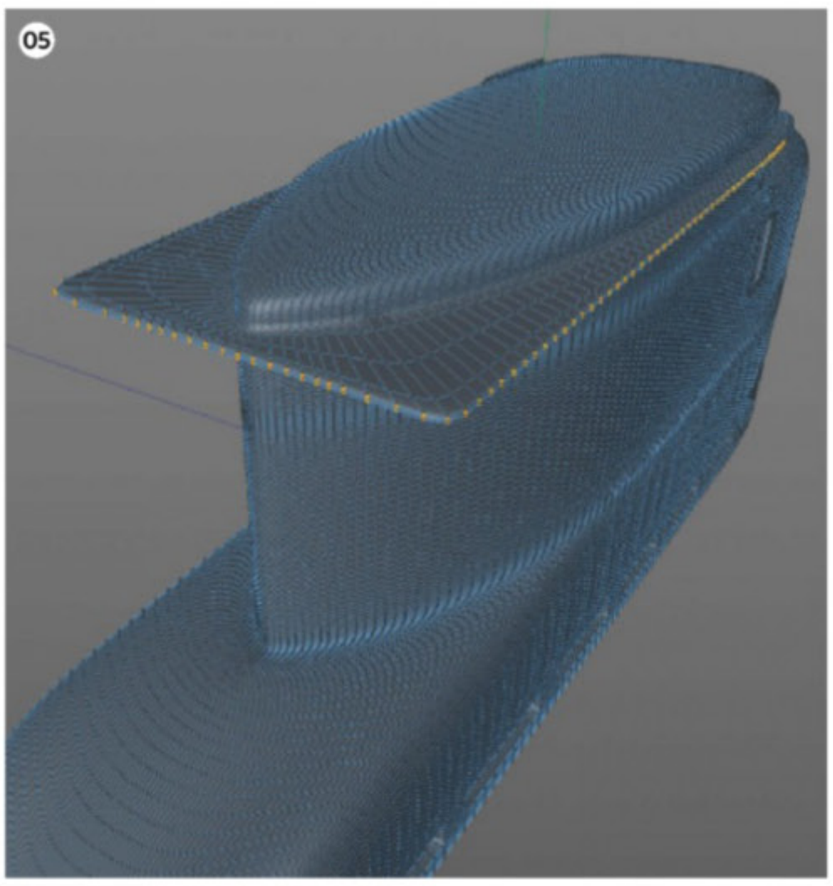
Add surface details

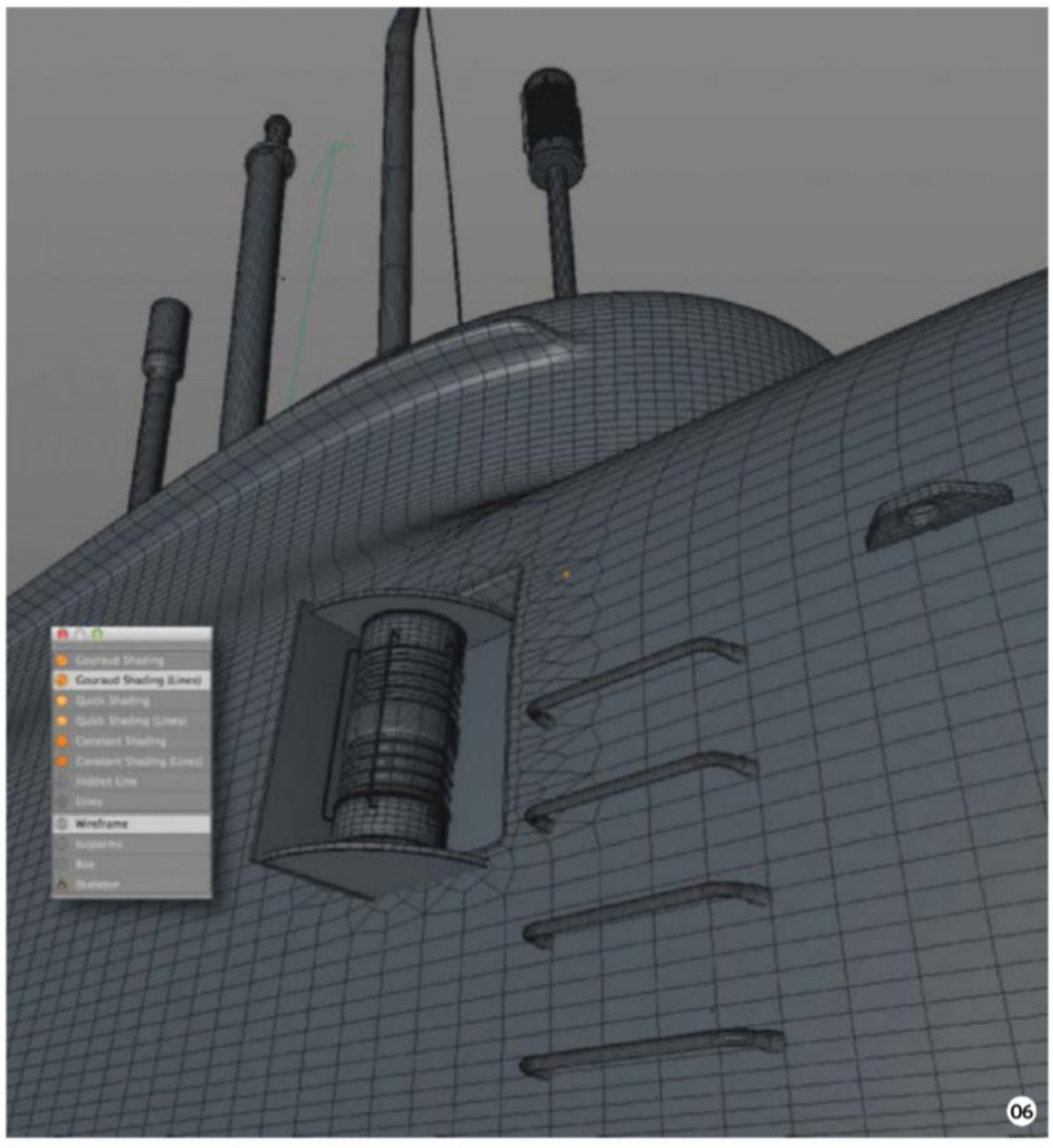
Include elements that make the model more realistic



04 Carve the flood openings After converting the SDS Object into a Polygon Object, put it into another SDS. Go to Polygon mode and select 12 polygons on both sides of the boat near the lower edge. This way you are creating the eight flooding openings that are necessary when the submarine has to dive. Be sure to first execute a slight inner extrusion before you extrude into the hull. This way you get smooth edges. Next do the same extrusion/inner extrusion combination for the notch of the position light.

05 Build the top fin The top fin stabilises the craft when moving underwater. It should be formed out from the tower top in order to receive an organic connection to it. The easiest way is to use the Point mode. Move one pair of points after the other to a Z position of -120cm on the right side, then pick the opposite pair and move Z to 120 cm. The rear edge of the fin needs point pairs that all have the same X position of approximately -240cm. Use the Structure Manager to ensure that the points are symmetrical.



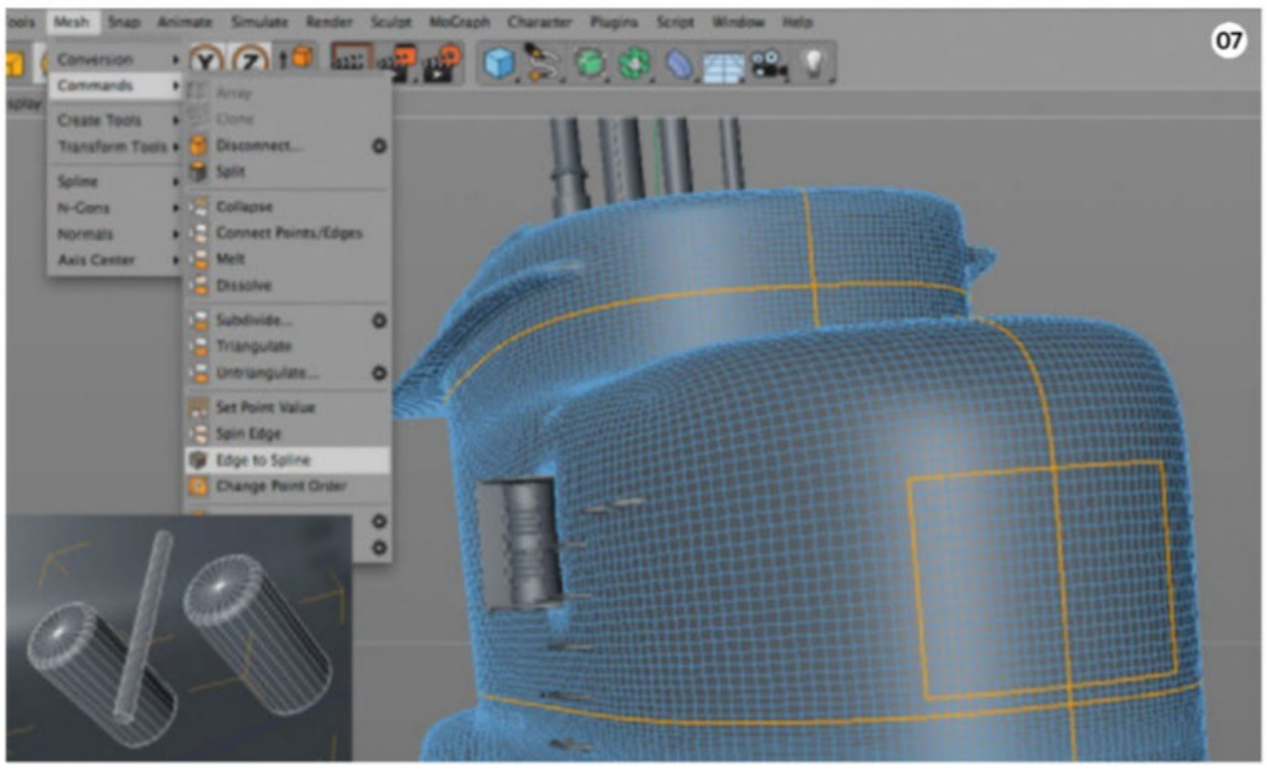


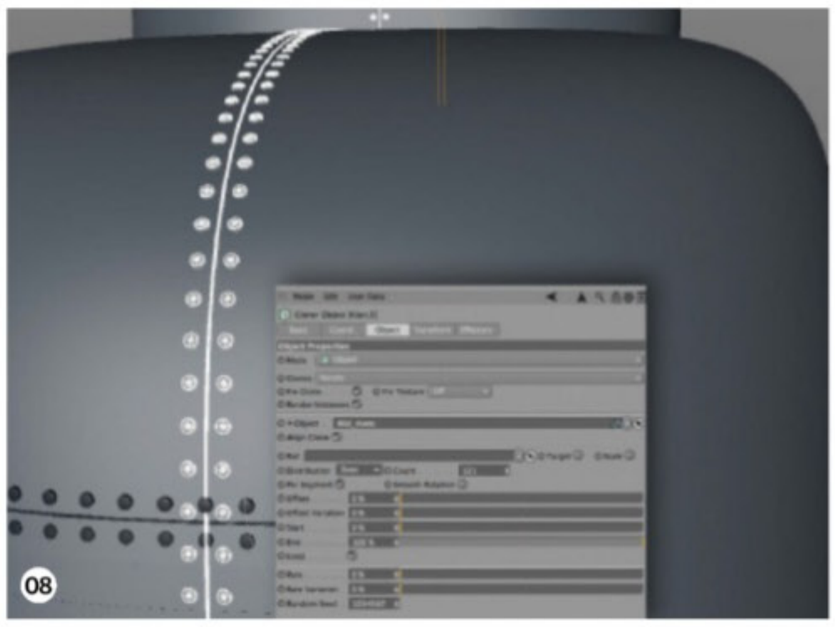
06 Add details The ladder, position lights, masts and the periscope are rather simple objects to model, and there are various ways to create them either from Parametric Objects or using splines and NURBS generators. When applying them to the craft, it's a good idea to use the Viewport's Display menu and switch from Normal Gouraud shading to Gouraud Shading with Lines. The ladder steps are all duplicates from the original step. Make sure to check the little box in the Duplicate dialogue that indicates them as Render Instances.

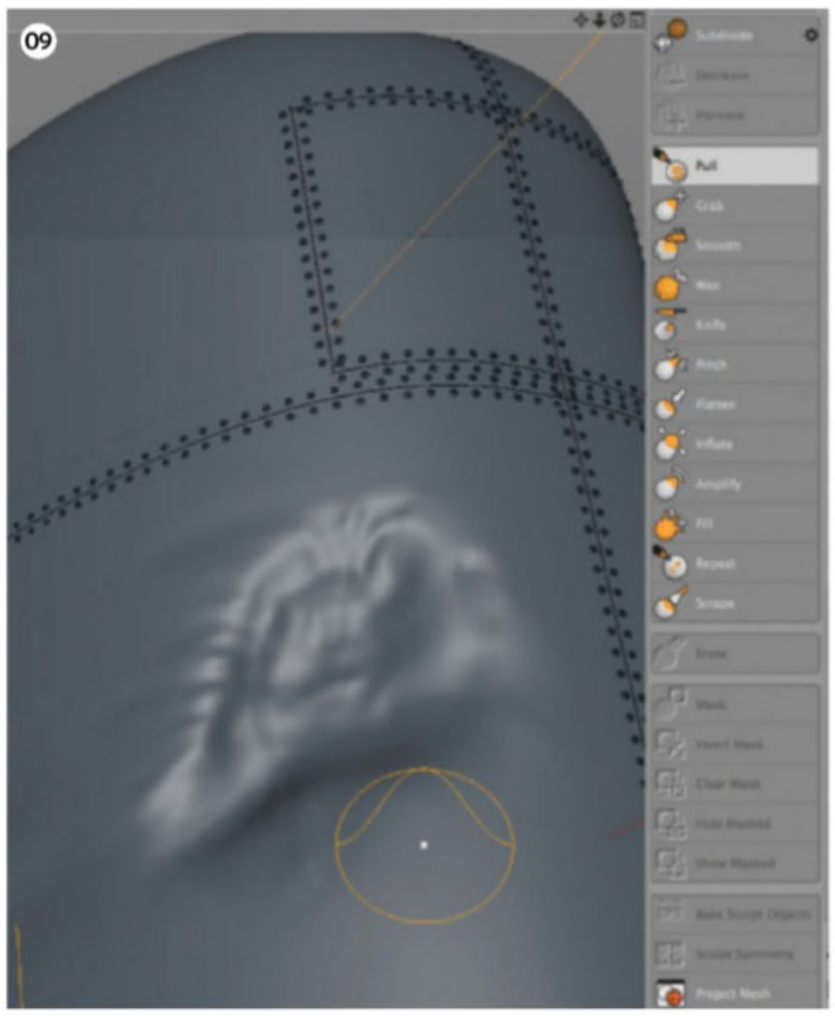
***Monorail* CINEMA 4D, Photoshop (2012)**
This is a commissioned work. I thought of creating the train in Photoshop, but it turned out that it was a lot easier to model in CINEMA 4D. Lights, smoke and steam are painted in Photoshop.

Use splines and sculpting

Add in rivets and environmental destruction







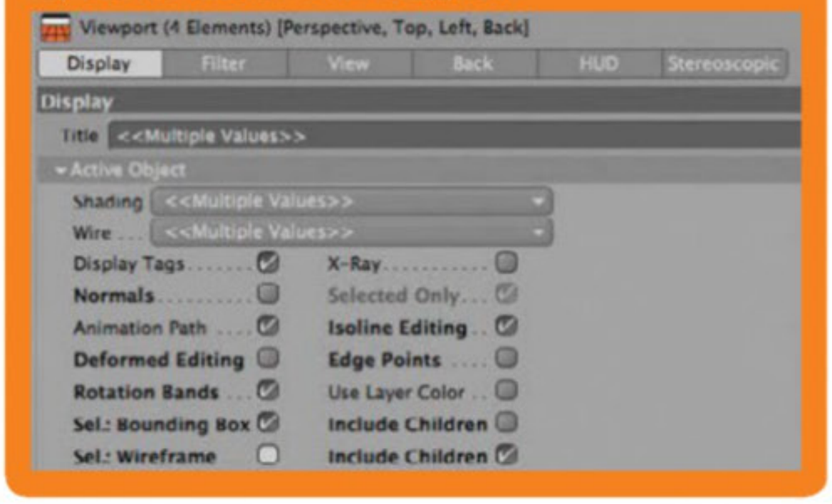
07 Create Splines The arrangement of the rivets needs a spline that indicates where they must be placed. There are plenty of edges that are suitable for this arrangement, so select them using the Loop Selection or the Path Selection tool. Whenever you finish one selection, go to Mesh>Commands>Edge to Spline and convert the Edge Selection into a new spline. The spline is childed to the tower mesh. A good idea is to name it properly, so you will always know where it is located on the mesh. The rivets themselves are a simple construction of a pair of cylinders and a third, very thin cylinder in between.

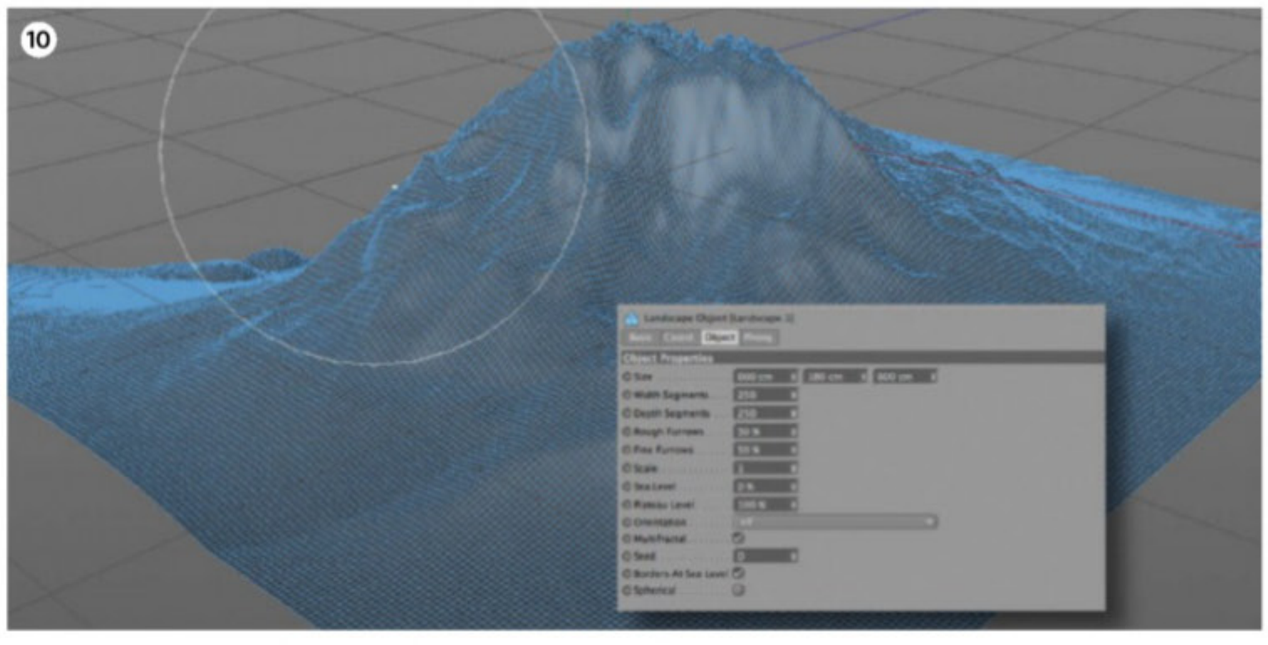
08 Align the splines The most useful tool to align the rivets is the Cloner Object, which you can find in the MoGraph menu. The three rivet cylinders are connected to one object, then childed to the Cloner Object. Try using the Object mode – in this case the spline is the Object. Name the spline Midrivets and move it to the Object Field. Make sure the Distribution is set to Even, otherwise the alignment will be irregular. Set the number of rivets you want and check the little box that indicates that they are Render Instances.

09 Sculpt dents These are just small details, but they really add to the scene. Change the layout from Standard to Sculpt. Make the tower mesh active and subdivide it once or twice, then use the Pull tool and try to build a little damage into the front part of the tower. If you want to push the polygons instead of pulling them, just press the Cmd/Ctrl key. The subdivision is not that high, so you can just go back to the Standard layout without baking the mesh.

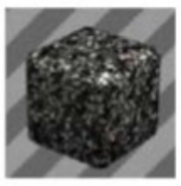
Settings for sculpting

The Sculpting tools of CINEMA 4D are generally quite self-explanatory. The only thing you should take care of is the Display mode – when subdivided, the white wireframe display does not work, as there are just too many lines visible. Click on one of the Sculpting tools, then hit the W key and the wireframe will disappear.



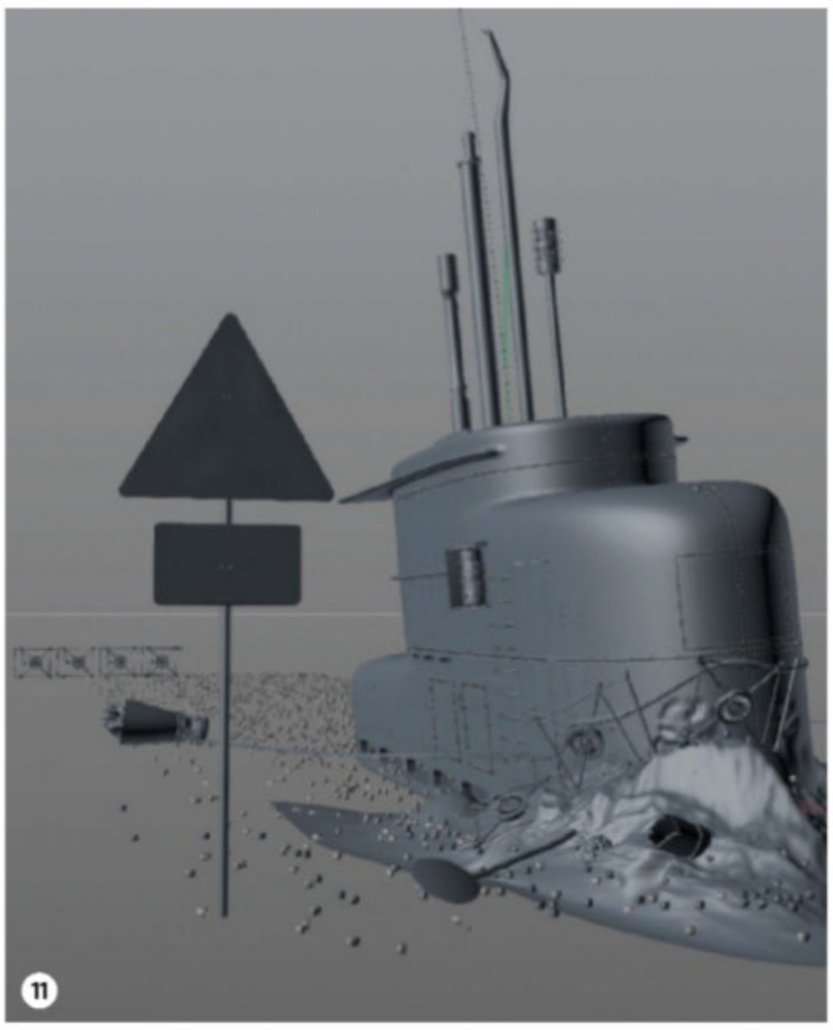


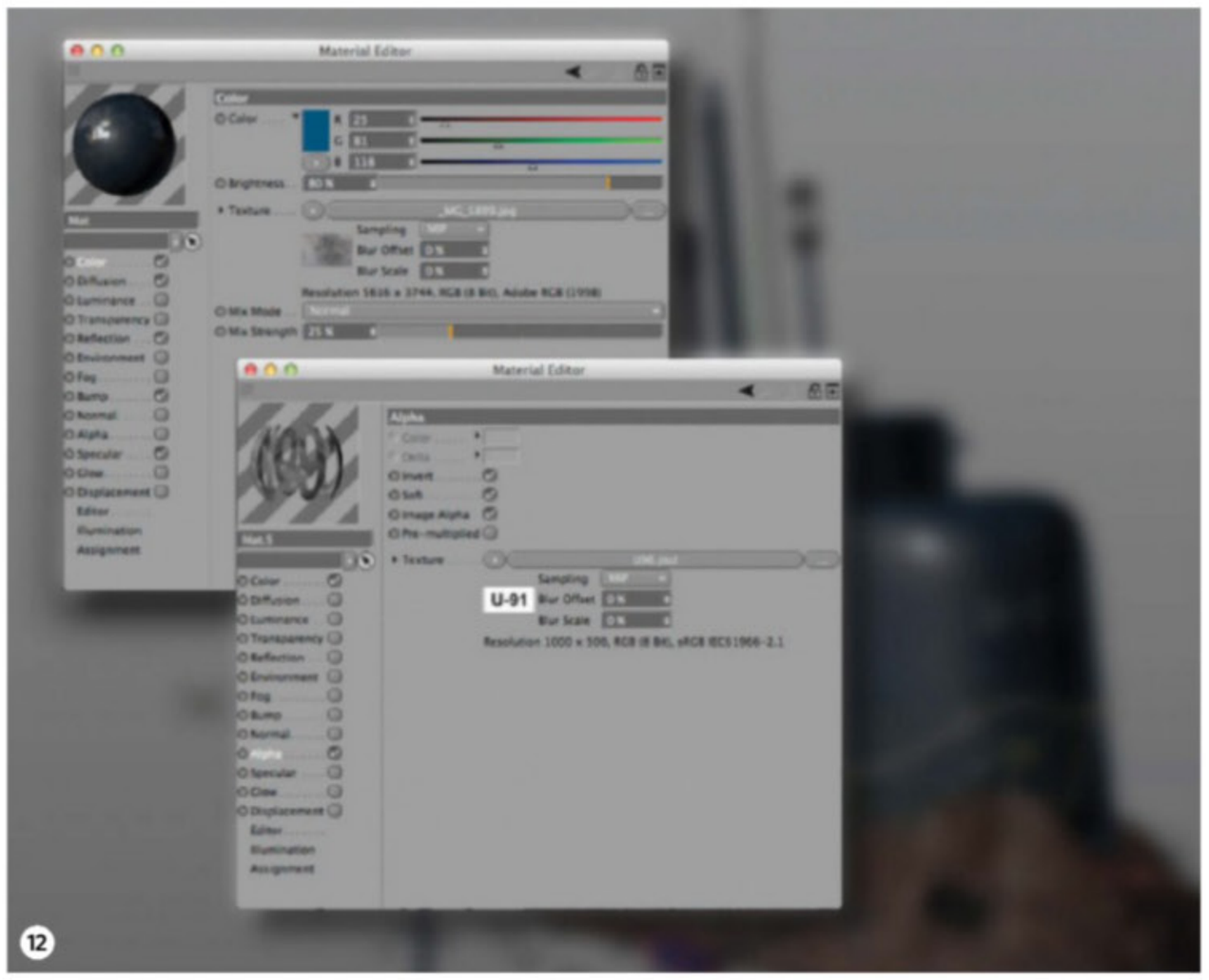
10 Build the sand heap The sand heap is made by the movement of the ship through the harbour street. It's a simple landscape object with a fairly low resolution, because the fine details mostly come from the material that will be applied later. Use the Magnet tool set to a size of 200 to 350 to create the sand heap. The Dome mode as the Shape of the tip works best.



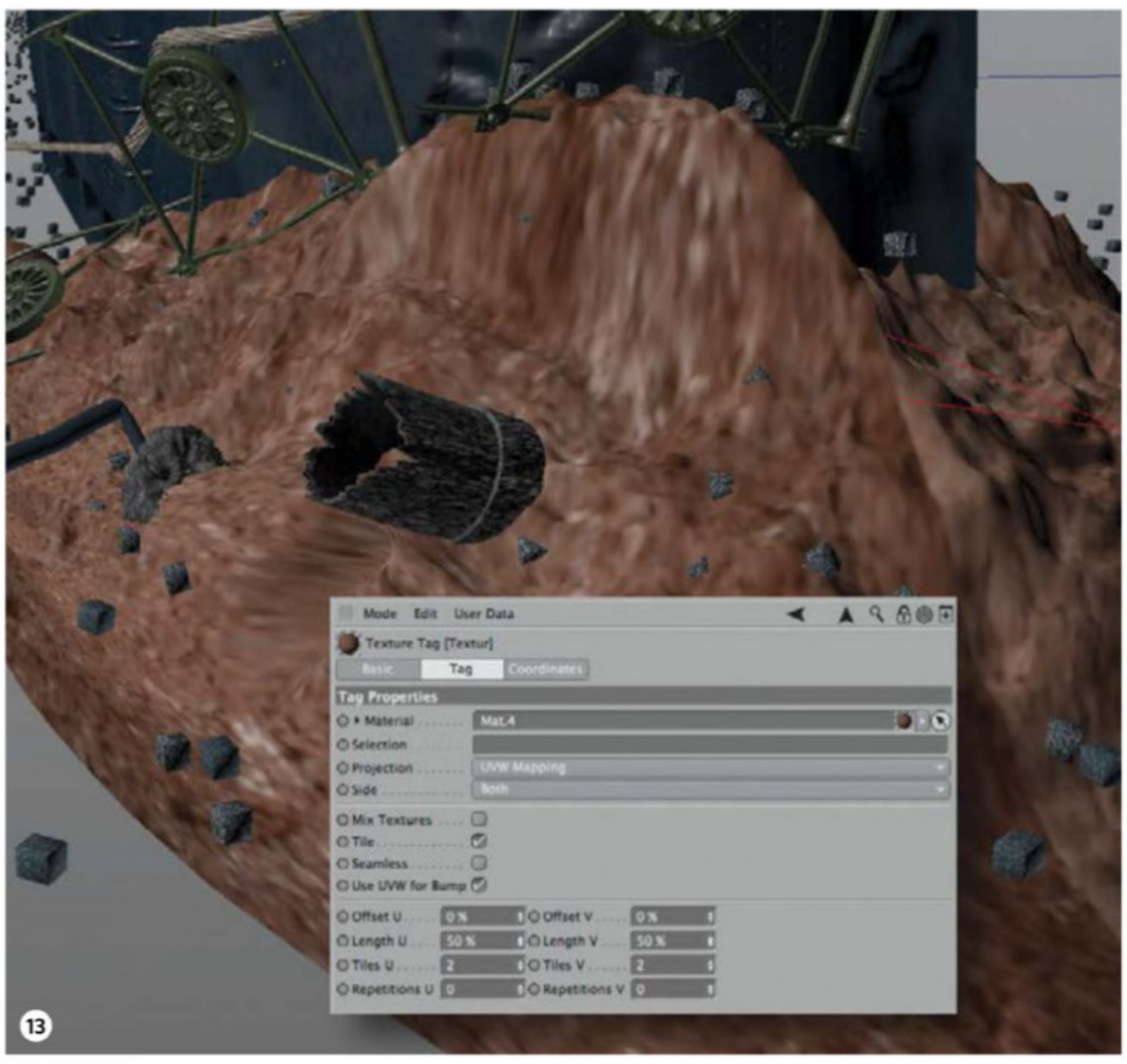
Texture the scene

Use photographic textures to create a sense of realism



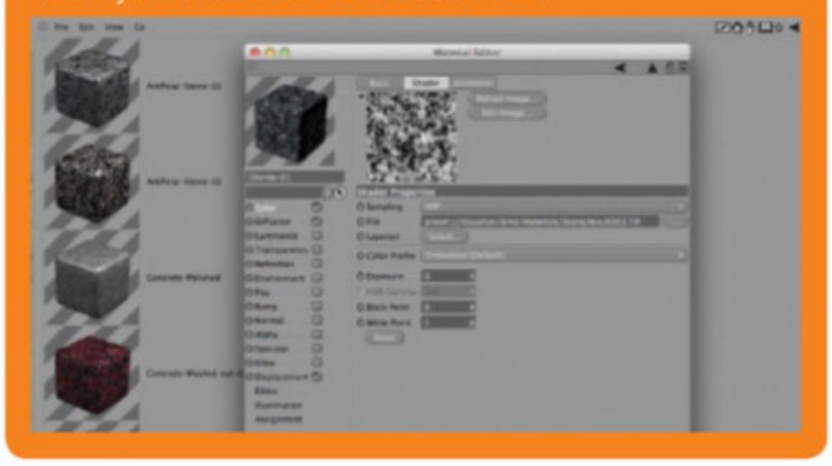


11 Prepare for texturing The traffic signs and the fence are easy to model from Parametric Objects. The cobblestones are copies of one single cube that has been distributed by the Cloner Object, just like the rivets in step 8. The Distribution Object is a plane and the fact that they are all rotated differently is achieved by a Random Effector, which is childed to the Cloner. The whole submarine tower with all the Objects should then be put into a Null Object and tilted 8-degrees to the side.



Using material presets

Not all the materials used in this scene have to be created by combining different texture channels. CINEMA 4D offers a huge amount of material presets that have been organised in folders named like the type of surface. You can easily access them through the Content Browser, which you will find in the Window menu.

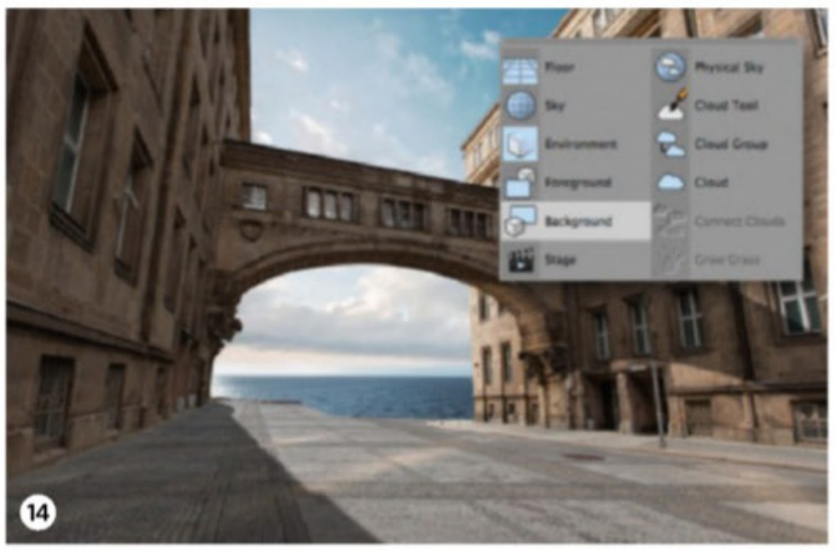


12 Body texture The texture for the submarine hull uses a photograph of a concrete wall in the Color channel. To add more structure, load it into the Bump channel as well. U96.psd is a Photoshop file that you can just move onto a Polygon Selection. Both materials are mapped in cubic projection and tiled to fit. Thankfully, when you move the borders of the material right to the edges where the rivets are placed, the borders do not affect the design.

13 Sand texture The sand texture needs to be mapped in UVW projection. Don't tile it too many times – about two times should be suitable. Make sure that the borders of the landscape mesh are moved under the level of the plane. Even if the unrendered look of the sand material seems to be a disaster, you will see that it renders perfectly well.

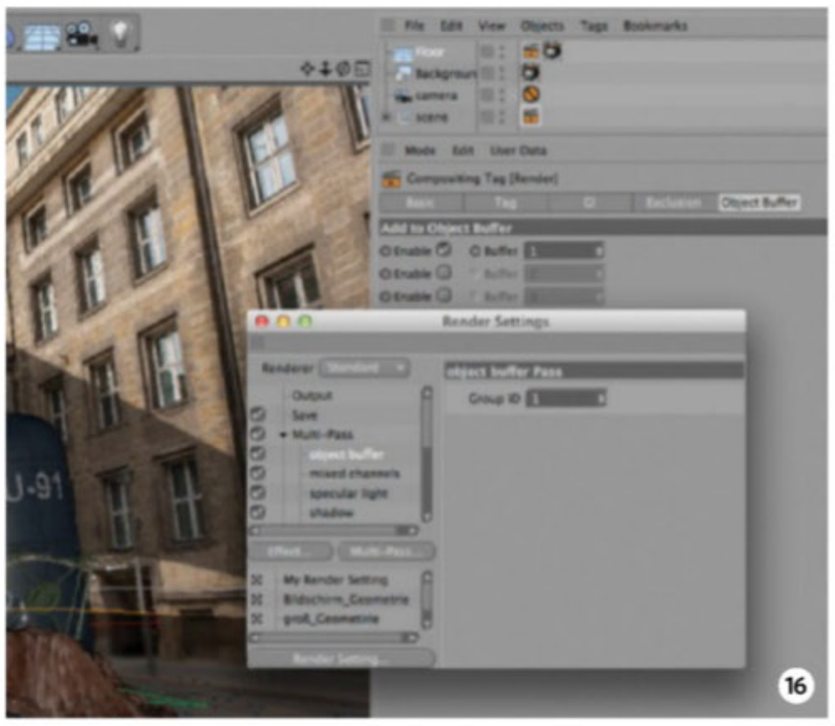
Composite the scene

Combine 2D and 3D using Background Objects



14 Add a Background Object Create a new Background Object in the Perspective View. Make sure that the render settings have the same ratio as the background image, otherwise the image itself will be distorted. Once you've done this, you just need to drag it onto the Background Object. The projection method is usually set on Frontal, so check that this is the case. Now you can install a new camera, set the focus to 21mm and match the horizon line of the grid with the horizon line created by the sea and the sky.

15 Frontal mapping The shadows of the boat, the sandheap and the cobblestones need a floor to catch them. Of course, you want to see the background image on the floor as well, so just move the material onto the Floor Object. Change the mapping method from UVW to Frontal and then grab a Compositing Tag from the CINEMA 4D Tag List and check the little box that says Compositing Background. CINEMA 4D will now automatically blend the floor seamlessly into the Background Object.



16 Object buffer pass Put the scene, without the floor and the Background Object, into a new Null. Add a Compositing Tag and go to the Object Buffer menu. There you can enable Buffer 1. This way when you render, CINEMA 4D creates an Alpha channel containing the whole scene. However, you must go to the Render Settings and create an Object Buffer ID (1 is smart, since you enabled Buffer 1). Then pick Ambient Occlusion and Global Illumination from the Effect list. After lighting the scene with a Physical Sky, you can render.

17 Finish in Photoshop In Photoshop, open the background image as well as the rendered scene. When you use multi-pass rendering, make sure that you set the Fill Method of the layer containing the Diffuse channel from Normal to Linear Dodge. The rest is pure Photoshop work, so mask the sand fountain, the captain and the seagulls into the scene. With a bit of Photoshop experience you will succeed in finishing the scene.

Use a Physical Sky

Lighting the scene is really simple. Create a Physical Sky Object and rotate it so that the Sun comes from the upper-left of the scene. Next, create a new area light, which will represent the sunlit house wall and won't need any shadow option. The Physical Sky can be masked out with a Compositing Tag – just uncheck Seen By Camera box.

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Step by step

Easy-to-follow guides take you from concept to the final render

Artist info

Arno Schmitz

3DArtistonline

Username: Arno

Personal portfolio site www.arnoschmitz.com

Country The Netherlands

Software used Maya, Mudbox, Photoshop, CrazyBump, ZBrush

Expertise Professional character artist specialised in anatomy and costuming

Detail Maya characters in Mudbox

Mage with a Cursed Gift 2012

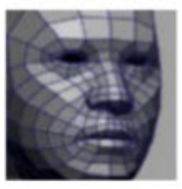
"In this tutorial we will look at how a Maya character model can be turned into a detailed sculpt and finalised using Mudbox"

Arno Schmitz is a character artist currently working for *Killzone* developer Guerrilla Games

In this tutorial I'm going to walk you through my character creation process, focusing on how to add detail to characters created in Maya using Mudbox.

We'll start with my original mage concept – for which a tutorial can be found on my website – then build the model to completion, starting with a base mesh in Maya, through to detailing and material definition in Mudbox, closing with the finished image. We'll pay special attention to damaged metals, cloth, skin and face surfacing.

I'll explain how I manage a character with so many detailed subparts and how to stay in control throughout the process. After touching on posing the character, I'll conclude by demonstrating my lighting and rendering workflow and then use Photoshop to add finishing touches.

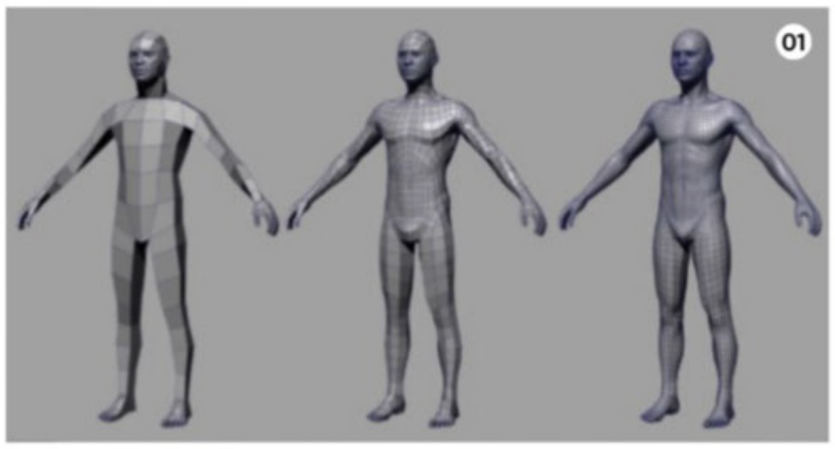


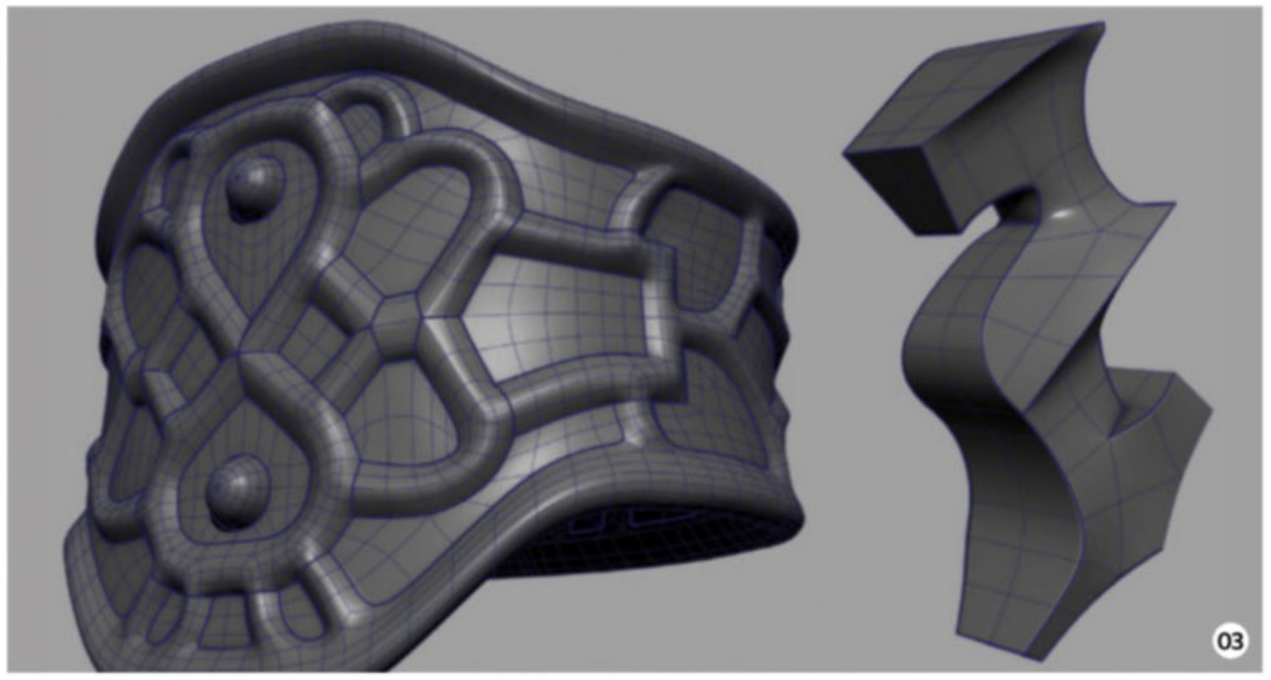
Model your character in Maya

Build a solid foundation before starting on details

01 Get started with a base mesh In my work, I tend to make a tool for base mesh creation that can blend between multiple body types and proportions. This enables me to quickly iterate and get the right body type for a specific concept much faster. Once I have something that fits this concept, I create multiple poses and use them as mannequins for further concepts, ensuring the proportions align exactly with the model. Once we have a solid concept, model all the costume pieces around the base mesh, working outwards to ensure that he will actually fit underneath his clothing.

02 Block out the clothes We'll use conventional modelling techniques for the costume, such as extrusion and vertex translation. When working with form-fitting pieces, try using Make Live to snap points to the surface of the base mesh to ensure a snug fit. Since all these pieces are going to be detailed in a sculpting package, use Smooth Preview to see how the mesh will behave when subdivided. Crease edges are used extensively to control the form and flow of subdivision on hard-surface objects, ensuring hard edges stay defined.





03 Prepare hard-surface parts for Mudbox When you want to transfer hard-surface objects to Mudbox, go to Modify>Convert>Mesh Preview to Polygons. In the Input settings, set the Division to 3 or 4, depending on how sharp you want the crease edges to be. It's also handy to have the objects UVed beforehand, so if anything alters the vertex order you can always get all your subdivision levels back. After importing the geometry into Mudbox, use Rebuild Subdivision Levels and add extra subdivision levels to round off the corners nicely.

Alternative methods

The method explained in step 3 also works in ZBrush. After exporting the OBJ file from Maya, use Reconstruct Subdiv in ZBrush and divide once or twice on top. You can also export your cage model with creased edges from Maya as a .ma file and use the Crease Levels in ZBrush to control on which division the edges turn smooth. ZBrush's Surface Noise feature is a great way to add metal or stone textures to your model, so hop between ZBrush and Mudbox to take advantage of features exclusive to each program.

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Tutorial files:

- Tutorial screenshots

Learn how to

- ☑ Block out characters in Maya
- ☑ Use Crease Edges in Maya
- ☑ Prepare hard surface objects for sculpting
- ☑ Define surface types using sculpting
- ☑ Create wear and damage
- ☑ Sculpt heads in Mudbox
- ☑ Add details with CrazyBump
- ☑ Light and render in mental ray

Add detail in Mudbox

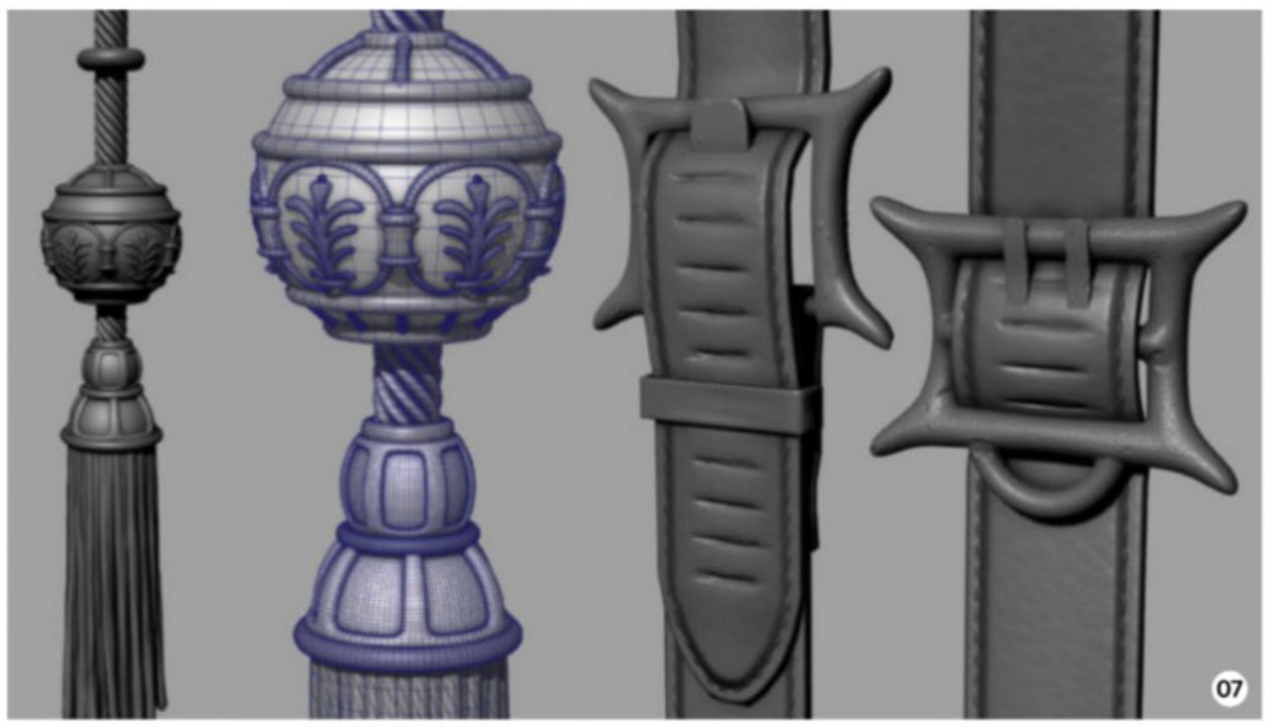
Create material definition through surface detail

04 Detail the metal pieces When sculpting the metal parts of the character, try to imagine how they have been damaged and aged over the years to give the items more authenticity. Start by using an Inflate brush with big Stamp Spacing and covering the entire mesh with big dents. Reduce this effect to 5% on a layer and it will mimic the look of blacksmith hammering. Add scratches with the Knife brush on the areas that are exposed or prone to scratching. Finally, hit every hard edge on the model with the Scrape brush to avoid the perfect, clean-edged look.

Build characters in stages

A good way to tackle any artistic challenge is to start with the most basic design decisions, such as silhouette, proportion and colour scheme. This will ensure a solid foundation before working on details. When these are established you can refine shapes, polish curved surfaces and use smaller areas of colour to add interest. This way of working can be applied to the entire character or any smaller, individual element, such as a costume piece. However, when aiming for something highly detailed, be sure to also include calmer spaces. This enables you to focus the viewer's attention on specific areas.

05 Use reference when sculpting cloth When working with cloth the importance of reference can't be stressed enough. To get my reference for folds I usually take pictures of a life model wearing an outfit comparable to the concept. I will then compile a reference sheet of these pictures, making it easier to keep all the views visible when sculpting. It isn't always possible to work from your own images, but it's still important to find references. Use the Wax and Move brush to replicate shapes in the reference images. Progressing from the lowest subdivision, push as much as possible before moving to a higher subdivision to refine the folds.



06 Finalise the cloth sculpt After the main volumes are blocked in, finalise the surface using the Bulge and Smooth brushes. It helps to use a material that is shiny, as the Specular lighting will help to reveal any peaks and wobbles in the folds. Switch your light often to double-check these issues. At the finishing stage, brushes like Scratch and Pinch are used to make seams. For really tight seams go over the pinched areas with the Bulge brush.

07 Reuse detailed accessories Instead of sculpting accessories like buckles multiple times, complete the Normal mapped low-poly versions individually in separate files and then populate the character with them. This way we can focus on making these parts extra-detailed without spending too much time on them. However, make sure you avoid very recognisable details on these objects, as it will give away that they have been repeated multiple times. If repeated objects are found in close proximity, add small variations to their design.

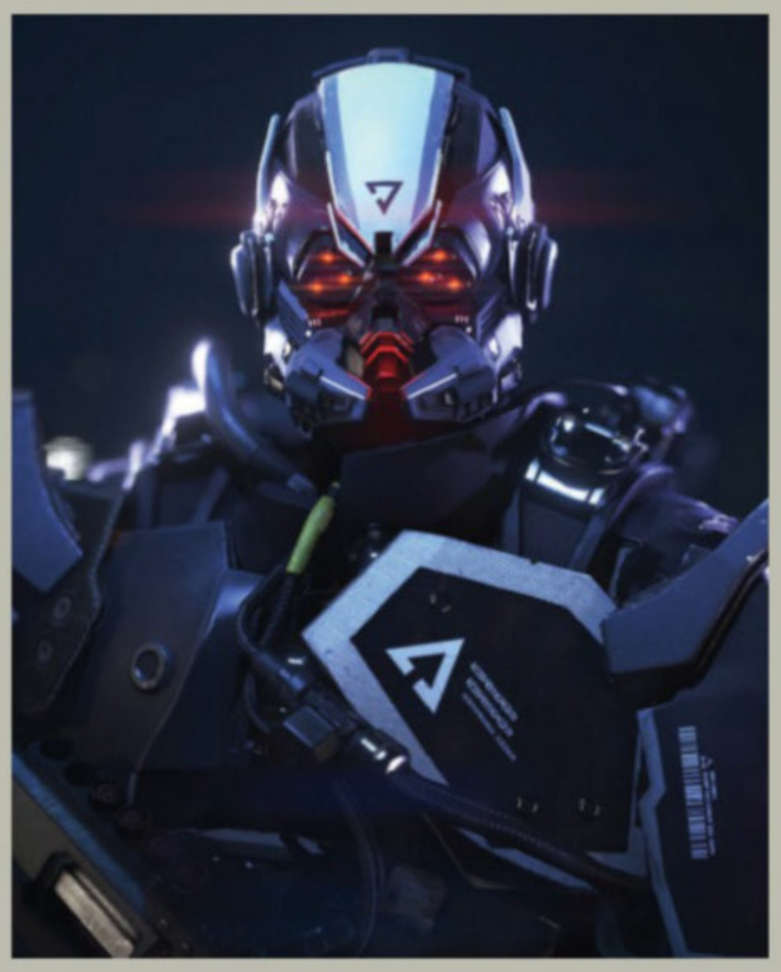
Concept

I wanted to create a monastic character who uses magical powers to cast lightning. Using these powers wounds him, which is shown by the bloodstained bandages. The pale complexion and veins also illustrate that these powers drain away his life.

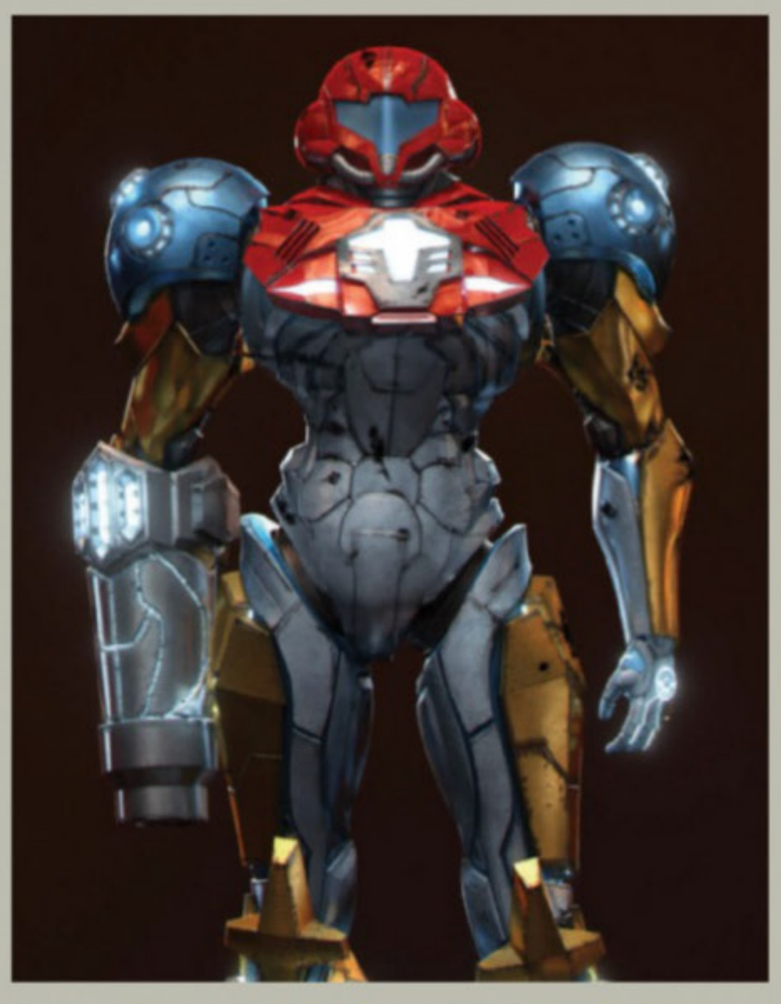
Artist showcase

Arno Schmitz

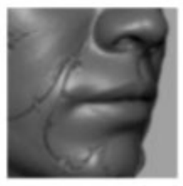
After studying visual art for games and later figure drawing in Florence, Arno landed a job at Guerrilla Games, where he worked on recent PlayStation 4 exclusive *Killzone: Shadow Fall*.



Killzone: Shadow Fall – Helghast Commando **Maya, ZBrush, Photoshop (2013)**
The Helghast commando, as depicted here, is one of the enemy types in *Killzone: Shadow Fall*.



Metroid Tribute **Maya, ZBrush, Photoshop (2013)**
A hard-surface project that exceeded the original scope and turned into full-blown tribute to *Metroid*.



Add surface definition

Increase the realism of the face

08 **Define the face** When working on the face, start with primary shapes and gradually refine through to secondary and tertiary shapes. Since we're working from a well-defined base mesh with multiple levels of subdivision, we can focus on capturing the essence of the concept. Make sure the personality and age are already clear with primary shapes at low subdivision levels. After retopologising, add some asymmetry and secondary shapes, such as smaller facial muscles, fat deposits and the main veins. These veins represent the physical toll the mage's powers take on his body.

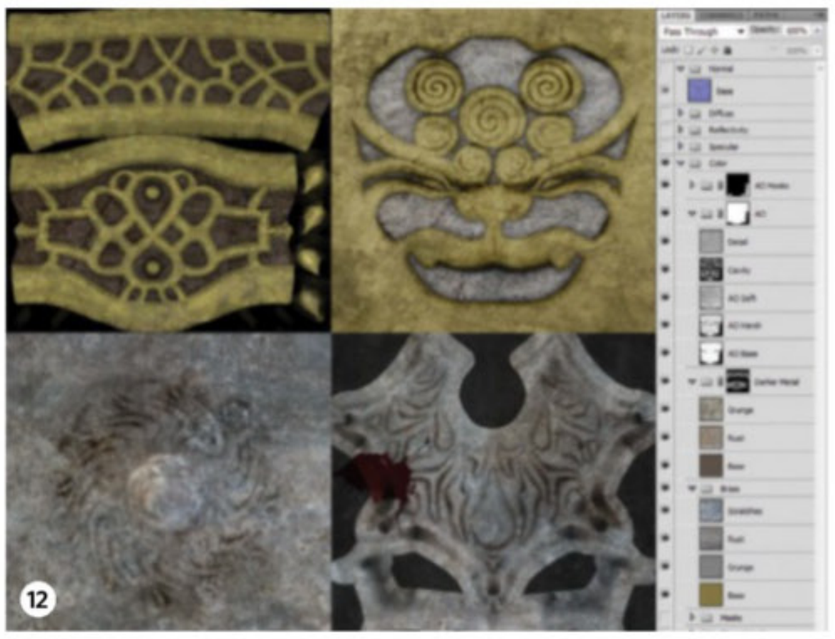
09 **Add meaningful details** Using Mudbox's powerful projection tools, apply photographs from multiple angles that serve as the starting point for the face texture. Adjust them in Photoshop to get the correct skin-tones and add more veins and small wounds to achieve the desired type of skin. When sculpting the tertiary forms, toggle the textures on and off, using them as a guide for the sculpted pores and smaller veins. At this point we will also sculpt the final skin details, wrinkles and the contact between the mask and face, highlighting the tension of the stitching and the scarred skin in these areas.

10 Use CrazyBump for fine detail Eventually you may run into a wall where you can't get the resolution needed even from the highest subdivision. At this point it's more effective to create details in the texture – it's a good idea to decide at the start of your project which details you want to sculpt and which you want to handle in the texture. In my case, all micro-details such as leathers, fabrics, metals, rust and skin pores are handled using CrazyBump. These Normal map details are then blended with the detail from the high-poly objects, creating a far more convincing Normal map that is consistent with the Color, Reflectivity and Specular maps.

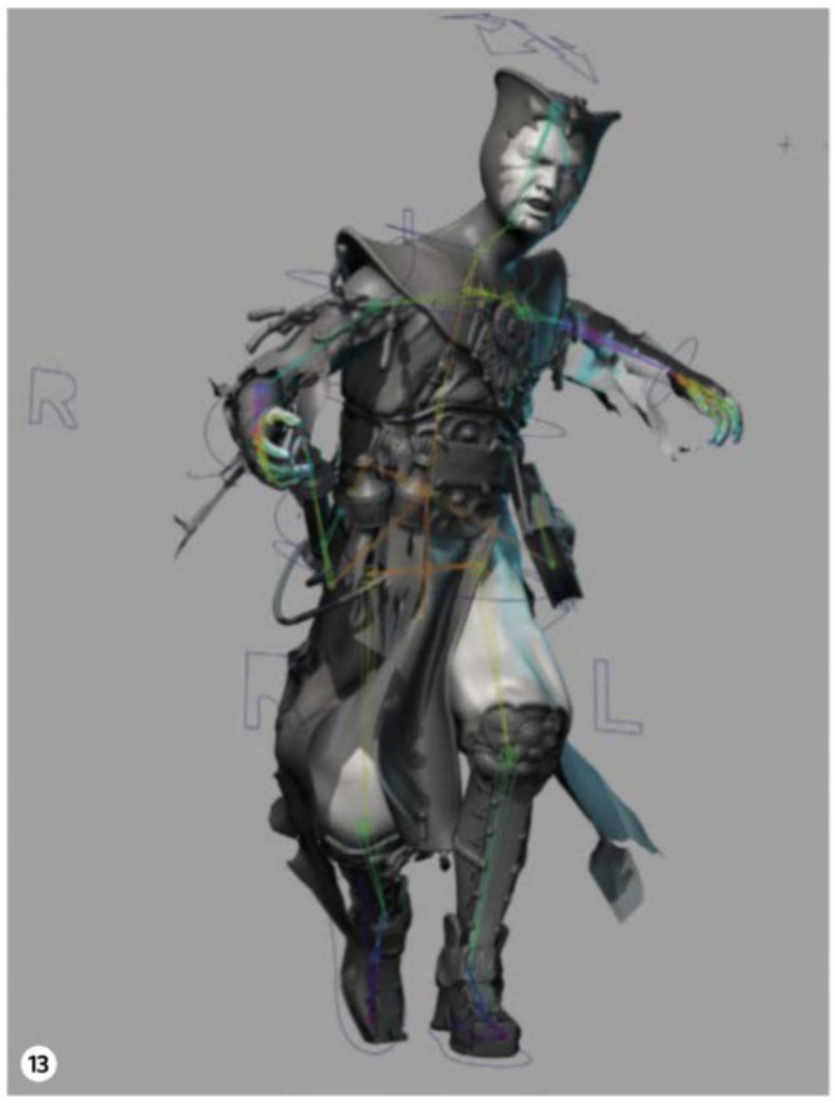
11 Use Mudbox for facial Blend Shapes Early on we decided to have both dynamic and passive poses for the final renders. We want to really sell those with matching facial expressions. Only Blend Shapes for extreme anger and sadness are needed. Using the Sculpting brushes we can really sell the compression and stretching of the skin when pulling such extreme expressions. Because the vertex ID doesn't change, we can easily apply our changes as a Blend Shape in Maya. A Normal map can be used to capture all the small wrinkles that are not present in the mesh.

Finalise your character

Add the finishing touches to bring your character to life



12 Texture balancing It's easy to lose track of the bigger picture when focusing on details, and because it's usually pretty late in the project before you see your complete character textured, it's very easy to end up with messy texture schemes. Before posing, compare and balance all the individual textures, making sure the big colour blocks read well, are distinct from each other and similar materials react the same way to light across the entire model. When using photographs as part of your texturing method it's easy to get weird hue shifts on your textures. This is the time to correct those.



Extra tips and advice

When starting a character project like this I recommend you begin with a solid concept. It can take a while to complete a project like this, so having a clear goal really helps to keep you on track. Keep proper construction and anatomy in mind at all times during modelling. If a task seems too intimidating at first, break it down into smaller pieces until it becomes manageable. Assemble all these pieces in a cohesive way to create an impressive end result. Finally, use elements like posing, lighting and atmosphere to enhance all of the work you have put into the character.

14 Render in mental ray Mia shaders are used to achieve nice, glossy reflections. At this point the result of adding all that edge-wear on the hard surface parts really shows, giving rise to some really interesting highlights, while the SSS shader creates believable skin behaviour. It's important to balance the scattering radius correctly to get the sickly pale skin we're after. Don't overdo SSS or you'll lose all your pore detail. Add extra fabric detail to your Normal map to make it contrast against the skin, leather and metals. For lighting, use area lights, Final Gathering and a HDR dome for the reflections.

13 Pose the character When posing, fully rig the character to make it quicker and easier to iterate. It's advisable to use a low-poly puppet to optimise the process. Make a selection of poses that best portray the essence of the character. These poses can then be transferred to the fully detailed version. All the cloth is simulated by nCloth to get correct deformation. When working with nCloth, keep the bind pose at frame 0 and put the actual pose later in the timeline. Usually you need 100 frames or more for the cloth to settle.

15 Post-process using Photoshop To finalise your image, take all the rendered layers and assemble them in Photoshop. Add effects to the beauty pass, such as AO, atmospheric and lens effects. A good way to create lots of depth is by layering smoke in the foreground and the background using your rendered depth pass to properly integrate them with your character. Emulate the focal point and peripheral vision of the human eye by using a lens blur and depth of field in a subtle way. This will help to guide the viewer and it's important if the character is quite detailed. Colour correction is the very final touch to add to your render.

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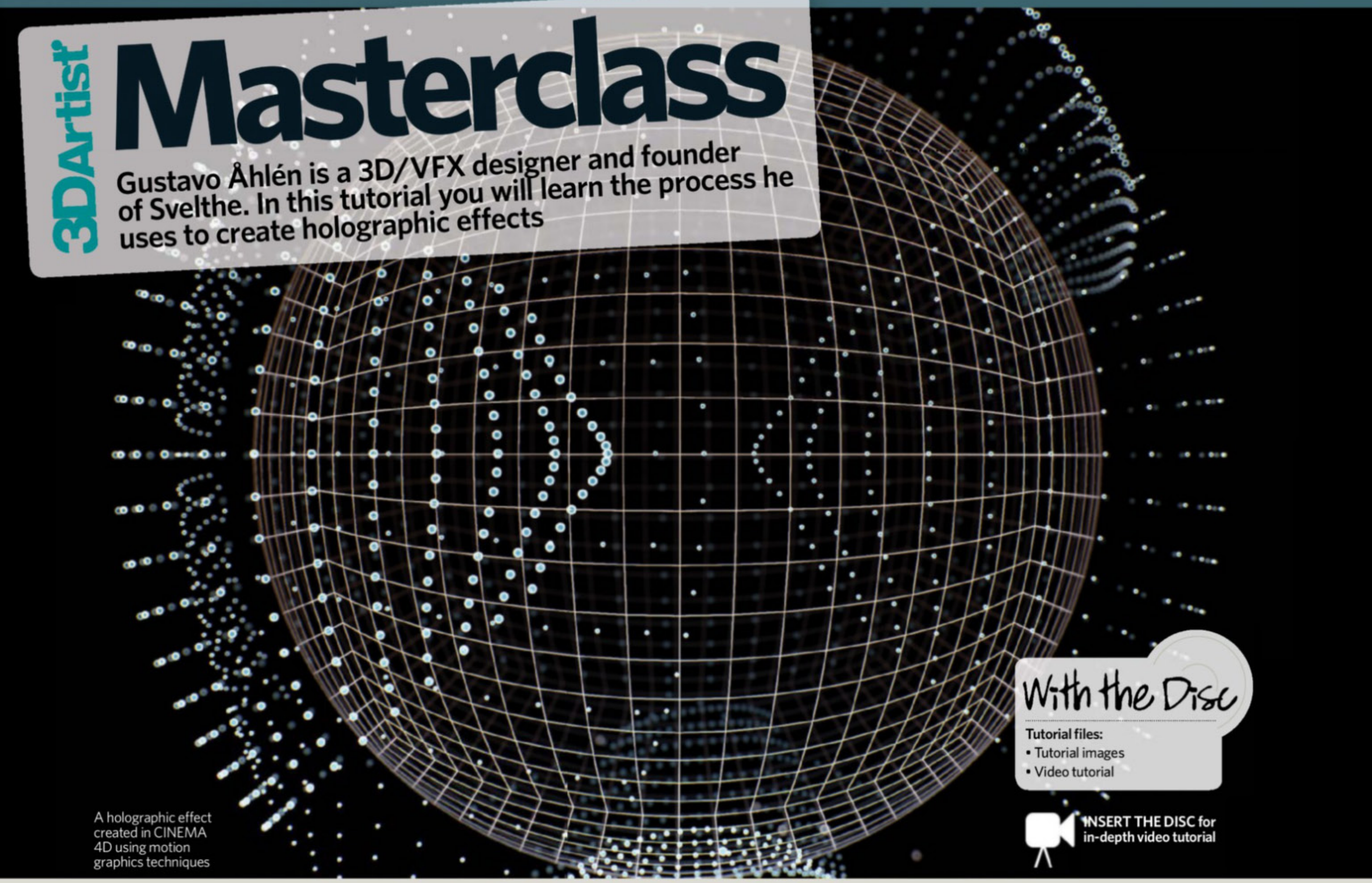
Masterclass

Gustavo Åhlén is a 3D/VFX designer and founder of Svelthe. In this tutorial you will learn the process he uses to create holographic effects



A holographic effect created in CINEMA 4D using motion graphics techniques

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Design holographic sci-fi effects

"Follow these simple steps to create a futuristic holographic effect in CINEMA 4D"

In this tutorial, we will take a look at the basic techniques needed to model and texture a hologram effect like those that are often seen in television and films such as the Marvel movies.

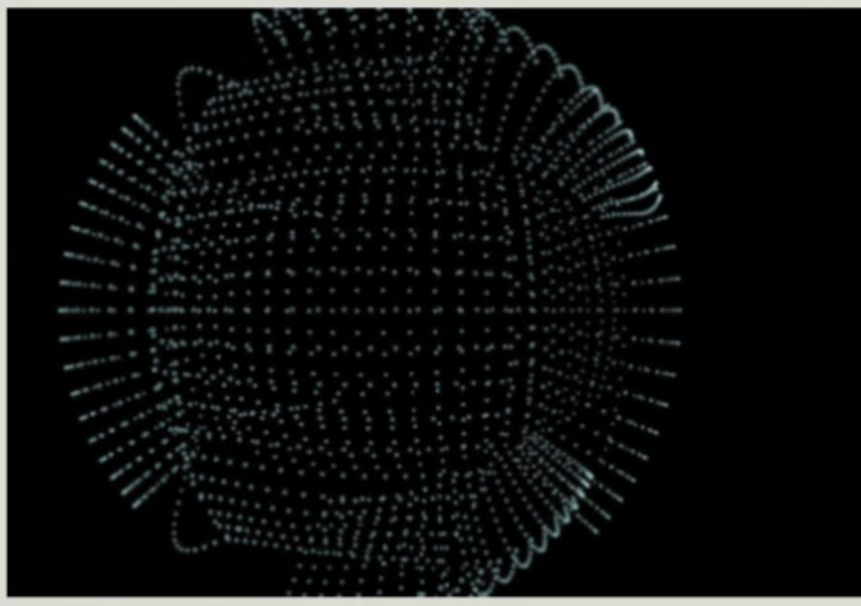
There are plenty of different methods that we can use to achieve this kind of effect, but in this tutorial we will cover the use of CINEMA 4D to create the hologram itself, then taking our completed animation into Adobe After Effects to add extra filters to really boost the sense of reality in our hologram. We will also use Atom Array to reveal the wireframe of our model. Using this tool will enable us to get a transparent wireframe to see through the 3D model. In these materials we must focus on the channels used in each texture, particularly Glow, Transparency and Luminance.

The techniques taught here will focus on both of these elements, but feel free to choose whichever method is more convenient according to your needs. Following the texturing process, it's important to understand the animation process using Mograph. In this function we can find useful tools, such as PolyFX, Formula, Random and so on. We can also apply depth of field cameras to get a better control over the space, which will give us a more realistic visual effect as the focus is on a particular object or particle.

Next we will add lights to the scene to create a light source that originates from our hologram. These light sources will be Parallel Spot lights, without forgetting to set them as volumetric lights so that we can see the path of light along the hologram. We can also add a noise effect to generate irregularities in the emission of light, which will emphasise the sense of realism.

For the geometry of our objects we'll use the Cloner in Mode>Object to build a sphere on each vertex. These will be small particles following the main object that we select. After this, we will need to hide the base object that we used as a reference model for the particles.

Certain procedures discussed here, such as texturing and animation, among others, can be applied in various ways to create different holographic effects. Throughout



Particles represented in each vertex of the base sphere created using the Cloner

this tutorial I highlight some of these alternative methods so you can attempt these varied styles. As with anything in 3D art, there are always numerous ways to achieve a common goal, so make sure that you're always experimenting!

Set the ball rolling

01 Make a reference object

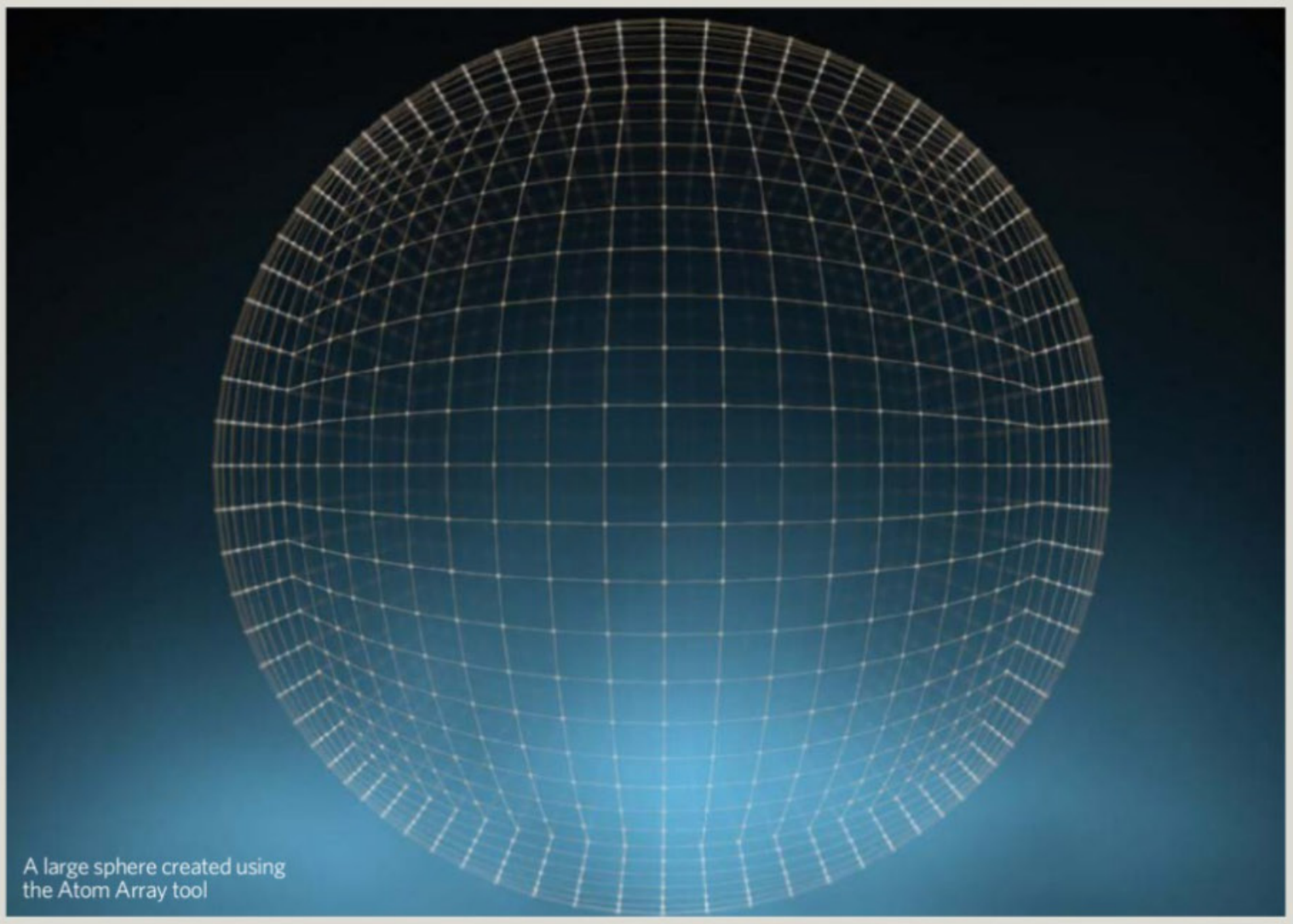
First we need to create a base object as a reference so that the particles can follow its vertices. You can use a human figure or any other shape, but in this tutorial I'll keep things simple and go with a sphere. Just remember that this process can be applied to other shapes. Go to Primitive Objects and select Sphere with the Radius set to 100cm, Segments at 60 and Type as Hexahedron. Make it editable by hitting C.

02 Clone particles

Go to Mograph>Cloner tool. Now add a sphere with small values. Drag and drop this sphere into the Cloner tool. In the Options section of the Cloner tool, you will need to set Mode to Object, Distribution to Vertex and in the object space you need to drag and drop the object created in the previous step. Hide the sphere we made in step 1. Take a look at the corresponding image to see what we're aiming for.

03 Generate a Formula Mograph Effector

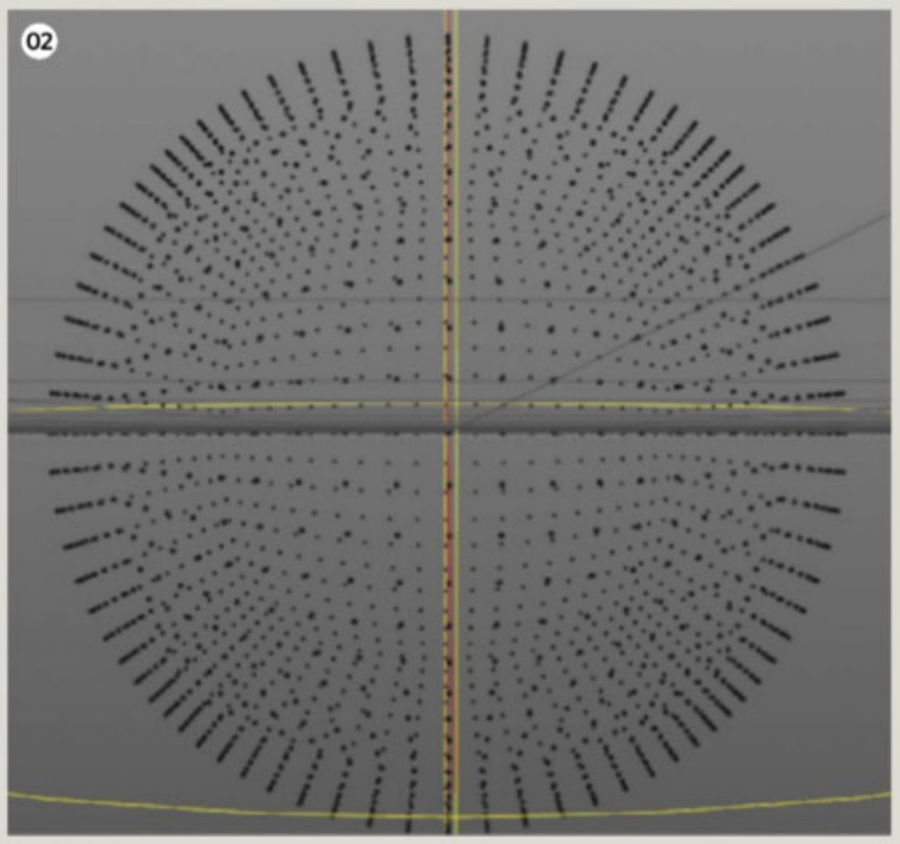
To start the animation process, we need to select the Cloner previously made, then go to Mograph>Effectors and select Formula. This is a great effector to create distortions over the meshes or objects. Just set the Timeline to 0, click on Formula and change the parameters of this effector while recording the settings. To record the strength of this effector, just set the timeline to 0, Strength to 0, Ctrl/right-click over Strength, add a keyframe, drag the timeline to the last second and change the Strength of Formula to 632. Ctrl/right-click over Strength and add another keyframe. Now play the animation to check this.

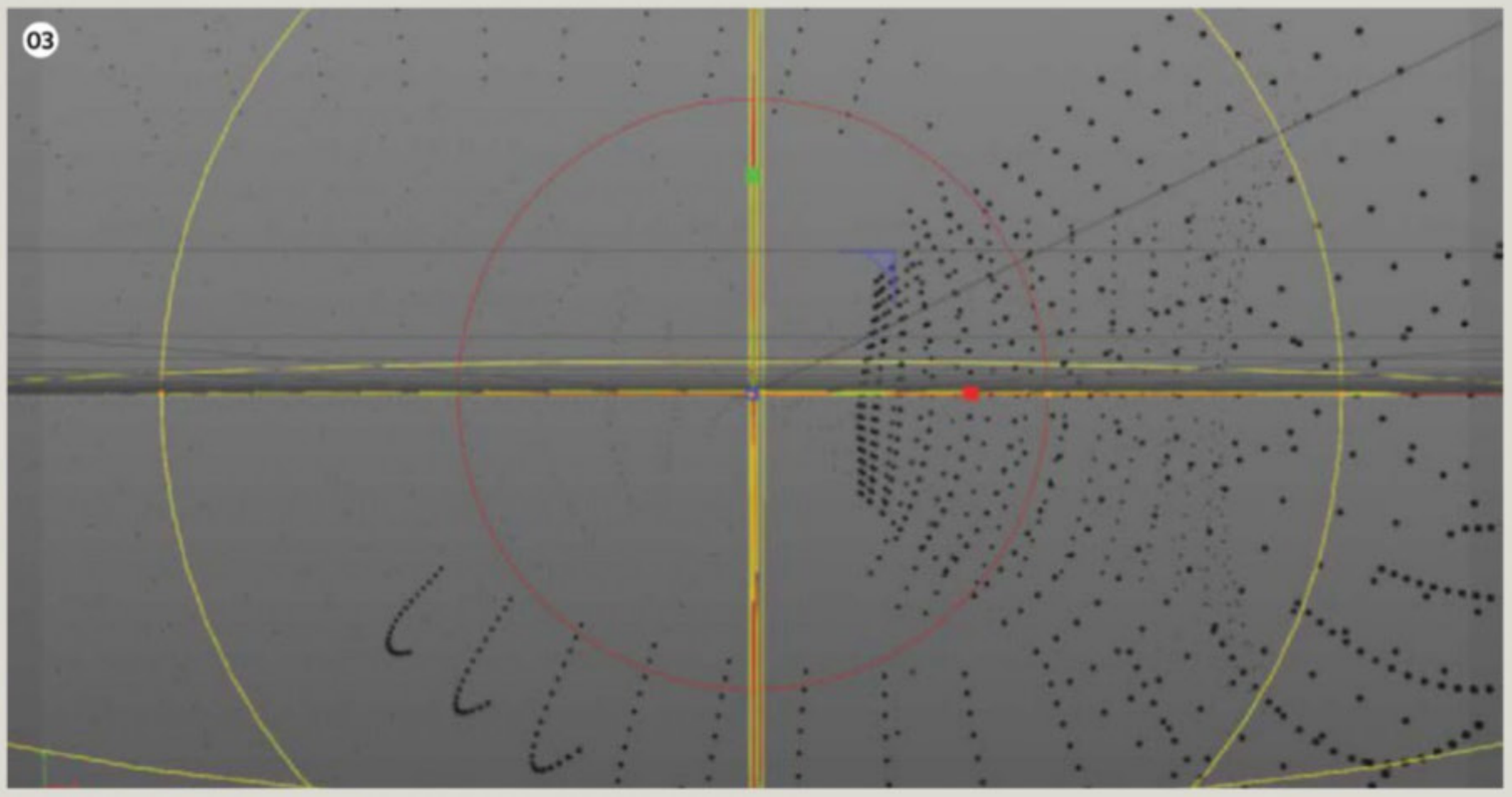


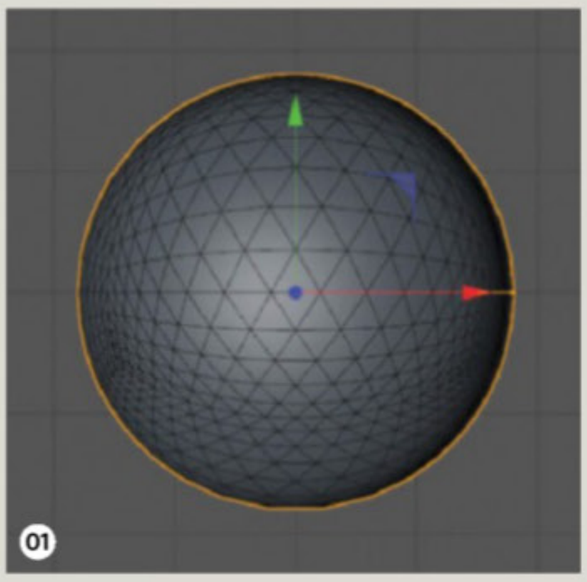
A large sphere created using the Atom Array tool

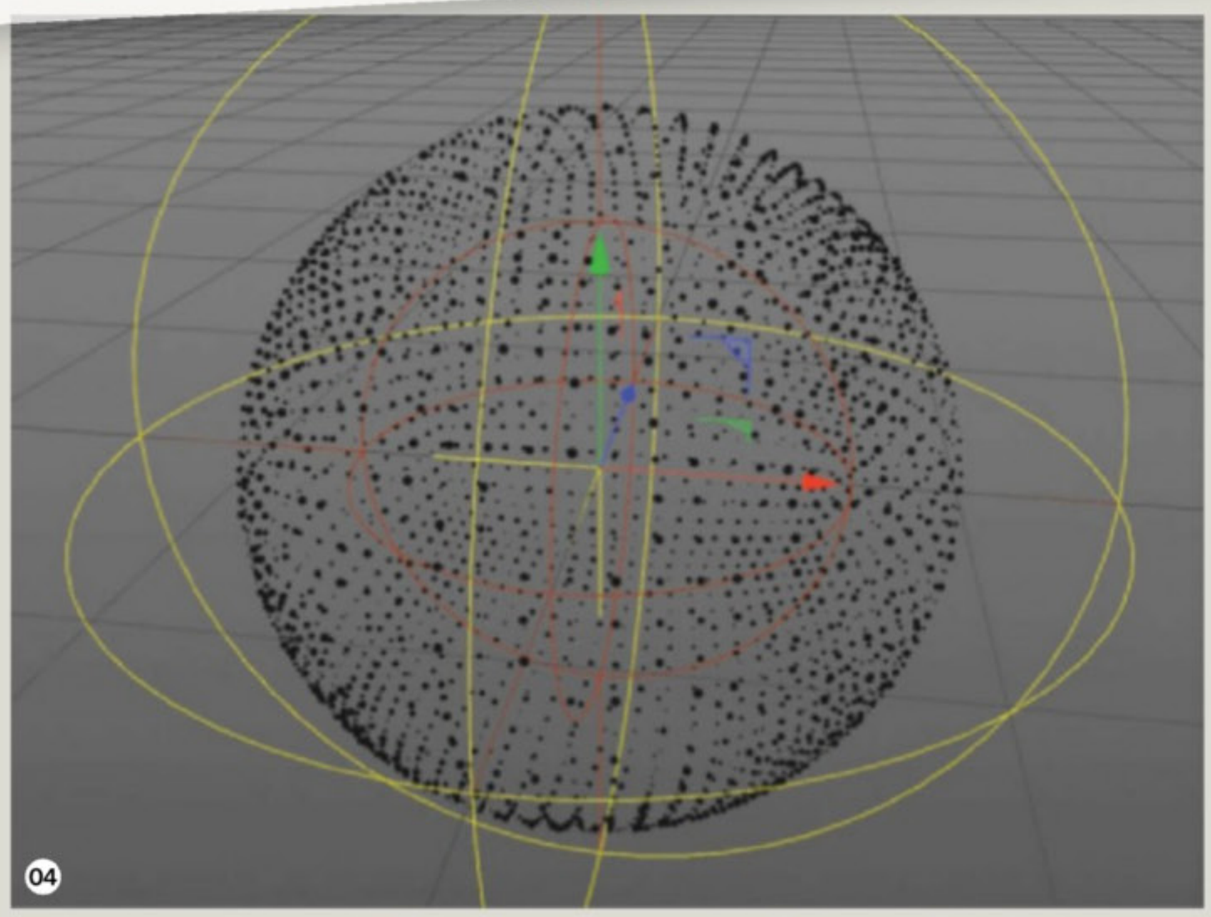
Use the Holomatrix plug-in for Adobe After Effects

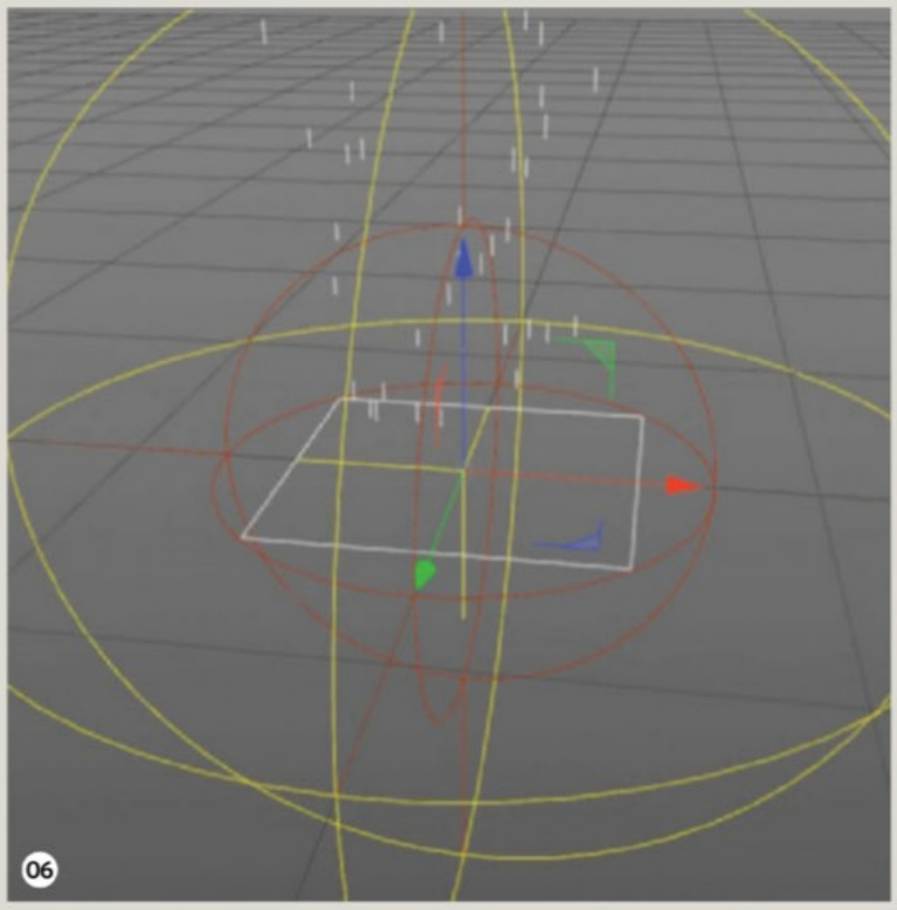
There are different methods to create holographic effects, but one of the most simple ways to create this effect is with a program called Holomatrix by Red Giant. This is a plug-in for After Effects, which will enable you to add different filters to the wireframe that you create in CINEMA 4D (or any other 3D software). Holomatrix is really very easy to get the hang of – simply create your 3D wireframe animation, export it into After Effects, then go to Window>Holomatrix and select a preset according to your tastes. You can modify all of the different parameters from the Settings menu in Holomatrix.









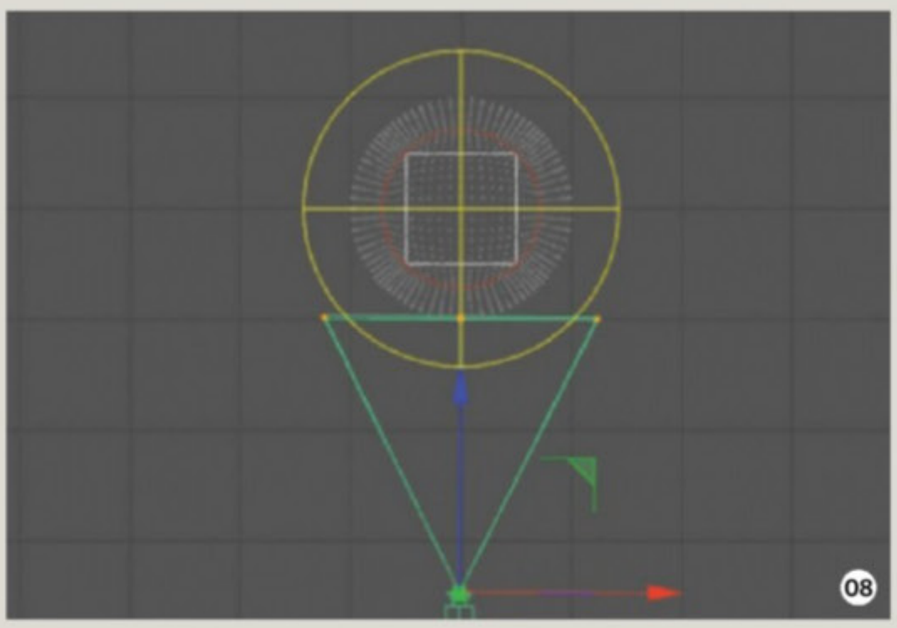


04 Include a random Mograph Effector

Continuing with the animation, let's set a random size for the small spheres that we created with the Cloner. While you have Cloner selected, go to Mograph>Effectors and select Random. This option will create random parameters for the objects. This effector enables us to get a better visualisation to break the uniform symmetry between all of the spheres. Go to Random>Parameters and check Scale, with Uniform Scale and Absolute Scale activated with a scale set to -16.89, though you should try using other parameters according to the size of your objects.

05 Build holograph shaders

This shader will be one of the most important steps as it will enable you to achieve the holographic effect with the correct configuration of the materials. In this particular case I preferred to use a material with the Luminance, Transparency and Glow channels all activated. Go to the Material panel and select New Material. Now you need to activate the previously mentioned channels. In this step's image you can see the parameters that should be used in each channel. Focus on the Luminance, Brightness as well as Glow Radius. You need to regulate all of the parameters to achieve a good effect.



Use the Cel Renderer in CINEMA 4D as an alternative

Using the Cel Renderer in CINEMA 4D is a another good approach to creating holograms. By selecting Color On or Color Off you can reveal the wireframe of the 3D mesh. The latter will reveal the assigned material on the 3D object. You will need to pay more attention to the mesh used because if you have triangles, these will be revealed. To help avoid this you can create a 3D object, remesh your model to create quadrangles and you will get a cleaner mesh than when using triangles. It will also create non-transparent surfaces.

06 Add a particle emitter

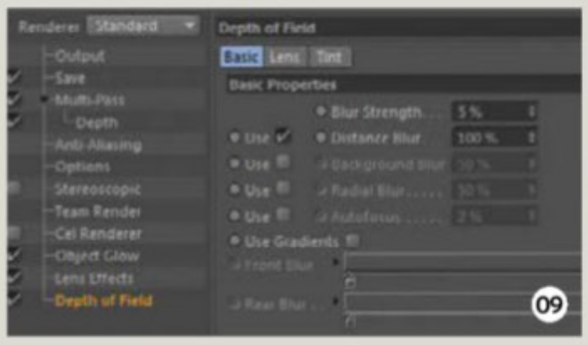
Go to Simulate>Particles and then select Emitter. Now you need to rotate this emitter to emit particles towards the sky. In the Emitter object, select the Particle tab and set both the Birthrate Editor and the Birthrate Render to a value of 42. Go to the tab called Emitter and select Angle Horizontal and then set it to 45. Now duplicate the spheres created in the previous steps into the Cloner object while you are holding Ctrl, then drag and drop that sphere into the Emitter object. Now the emitter will emit the geometry of these small spheres. You can assign the material that we previously created.

07 Set up a light source

Click on the Lights icon and then choose the light called Spot Light. In the General tab, set the Type to Parallel Spot, Shadow to Raytraced (Hard), and Visible Light to Volumetric. Now redirect this light with an angle of 90-degrees using a target towards the sky. Try to follow the parameters that have been used in the complete C4D scene file that comes with the issue.

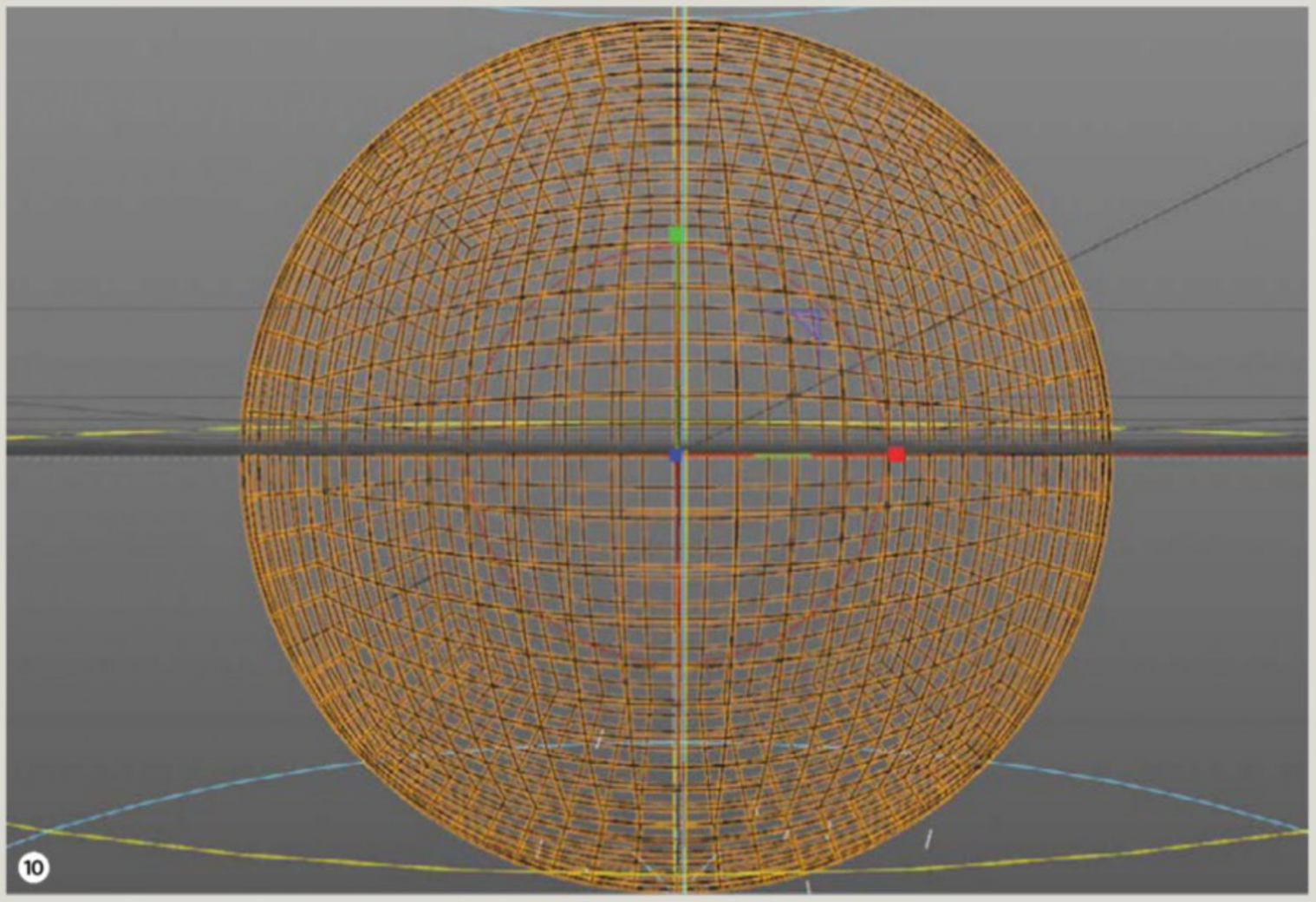
08 Create depth of field

Adding depth of field in this step will help to enhance the final look of the work. Go to the Cameras icon and select Add A Camera. Now choose the Camera object, select the Object tab and set the Focus Distance according the intermediate point that you wish to focus on. In the Details tab you need to activate DOF Map Rear Blur. By using the top view you can see where the camera is focused and where the DOF blur starts. Try testing out some different approaches here – you may find results that you didn't expect.



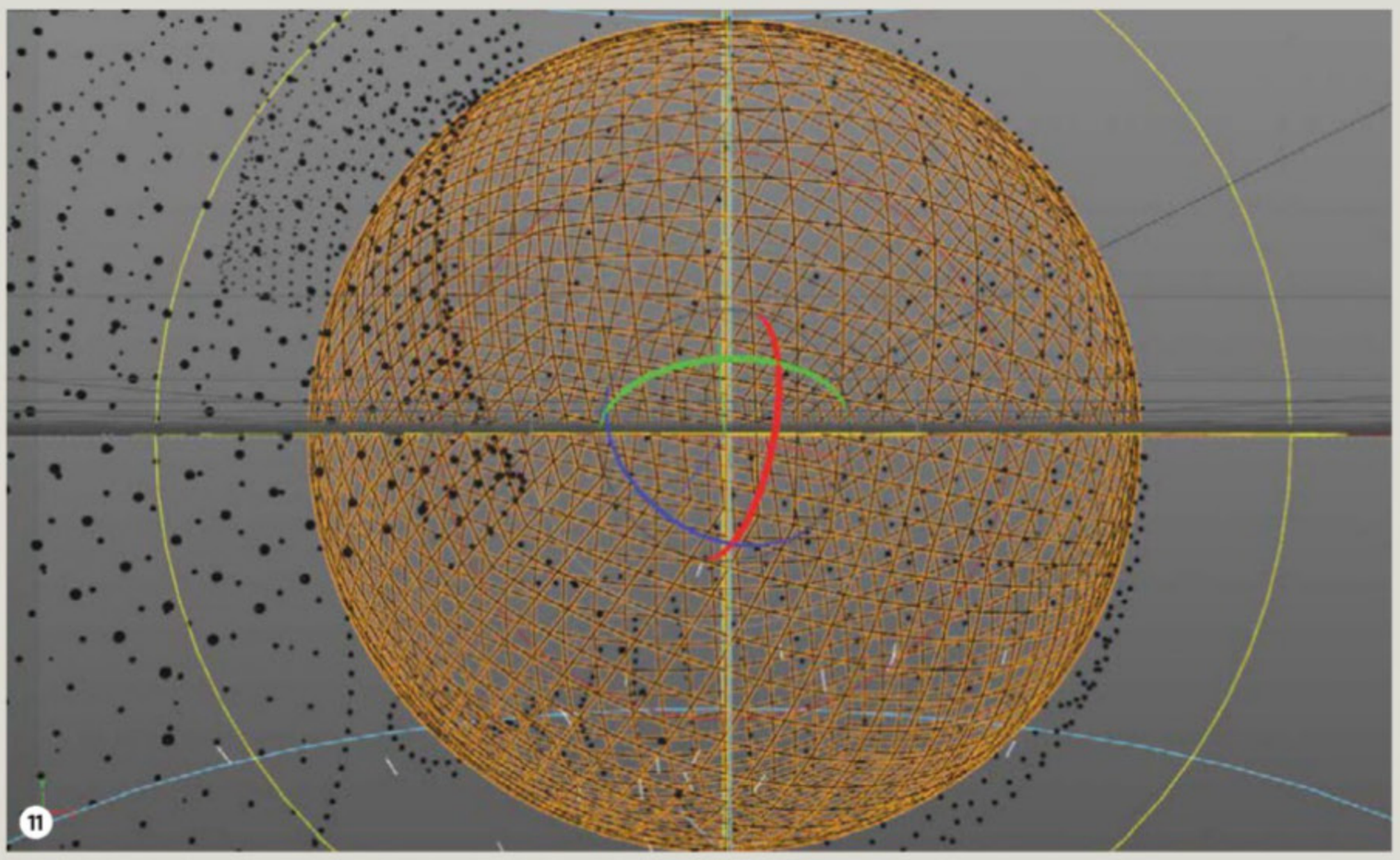
09 Adjust DOF settings

DOF settings are one of the most important functions, because they give you different results through simply activating or deactivating Tint in Depth of Field. If you activate DOF Tint, this will remove the lights over the background, but it will keep the illumination over the mesh. Go to Render Settings>Effect>Depth Of Field. Activate Multi-Pass by going to Multi-Pass and selecting Depth. This will create a separate Depth Alpha channel to be used in After Effects or any other software to regulate the DOF strength. Set Blur Strength to 5% and Distance Blur to 100%.



10 Create sphere wireframe using Atom Array

It is time to create the wireframe for the larger sphere. Go to Array>Atom Array. Now drag and drop the sphere we made in the first step into Atom Array object with the Cylinder Radius set to 0.05 and Sphere Radius set to 0.05. Using these options you can control the thickness of the wireframe and you can change it according your personal taste. Atom Array enables us to create a transparent wireframe instead of using the Cel Renderer. You can duplicate the material previously made, but change the illumination colour for some variation.



11 Animate the large sphere

As we've made a large reference sphere for each particle represented with the Cloner tool, if we rotate or resize this sphere, all the particles will also change around it. Set the frame to 0, press the Autokeying icon and change the timeline to the last frame (90), and rotate the large sphere. You will see how each particle around this sphere changes position. This will create a new keyframe to record the variations of angles. Click play and see how it works.

12 Change the animation render settings

Go to Render Settings and use a Frame Range of All Frames to render the complete animation. Achieve good anti-aliasing using the Best and Gauss (animation) options to get a good transition between each frame. You can test different types of filters – just test render some frames and check the transition between them.

Alternative use of Atom Array in CINEMA 4D

Atom Array is one of my favourite methods to reveal wireframes because you can get a transparent 3D object and see the wireframes through the surface. It's like having a transparent shader – no colour, no specularity and no reflections, just the vertex and edges. Go to the Array icon and select Atom Array. Now you need to add a simple sphere and drag and drop that sphere into the Atom Array object. This will reveal the wireframe and you can resize the thickness of the wireframe according to your wishes in the Object Properties.

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

3DArtist

Back to basics

After last issue, Jahirul Amin guides us through rigging and skinning a cuttlefish in Maya

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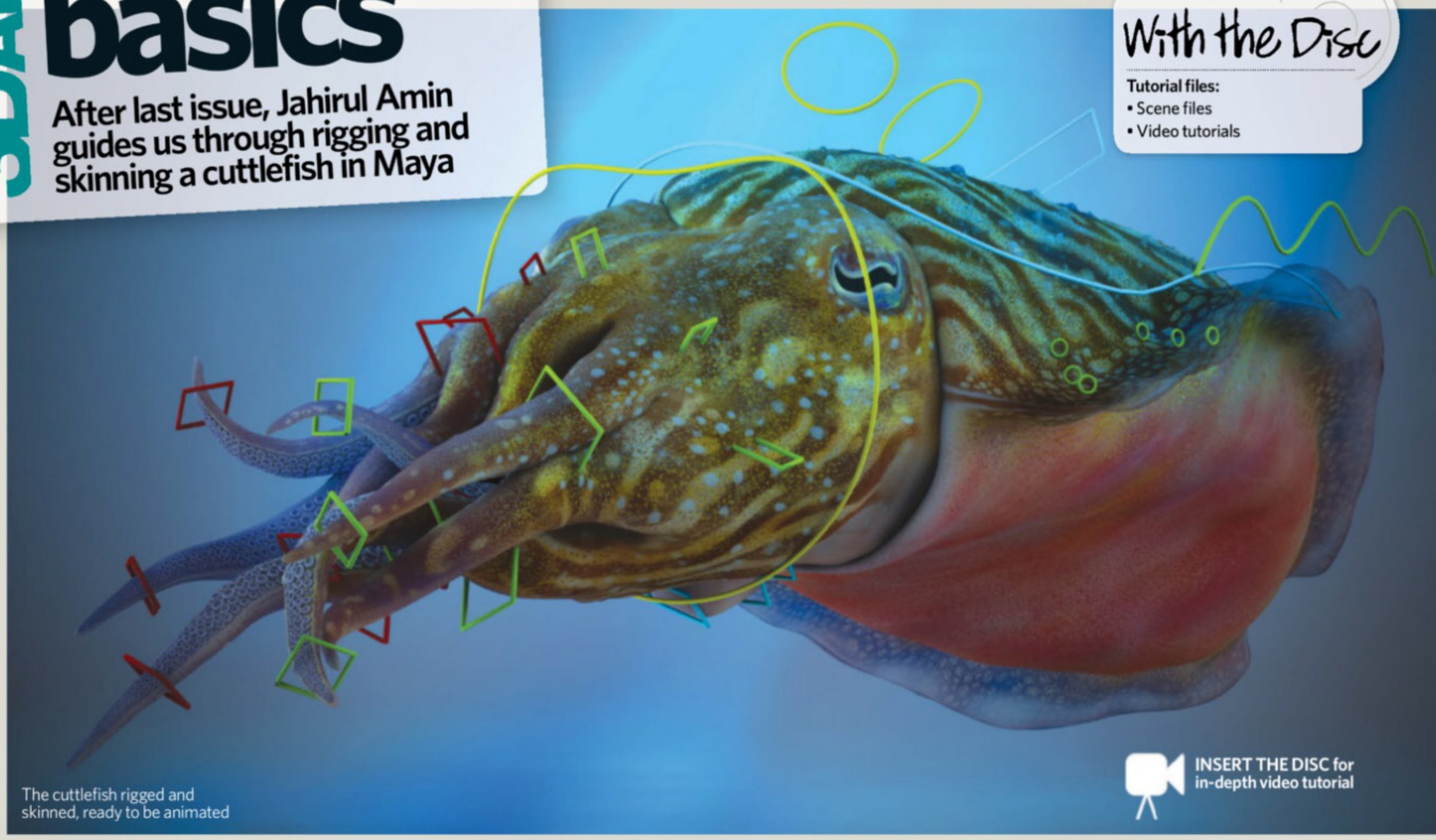


The cuttlefish rigged and skinned, ready to be animated

INSERT THE DISC for in-depth video tutorial

Rig a cuttlefish in Maya

"After texturing our cuttlefish last issue, Jahirul Amin now takes us through the process of creating a dynamic rig and skinning the mesh of our water-dwelling friend"

In this third tutorial of our four-part cuttlefish series, we will rig and skin our aquatic companion. Adding joints to a totally jointless creature with ten appendages is a great fun, though it's a pretty testing exercise. This cuttlefish – like its famous cephalopod cousins, the octopus and squid – has arms and tentacles that display the fluid and powerfully purposeful movements common to this class. However, with the cuttlefish there is the additional consideration of the fin that circles its body, which has a kind of motion that's usually seen with a fish's caudal fin.

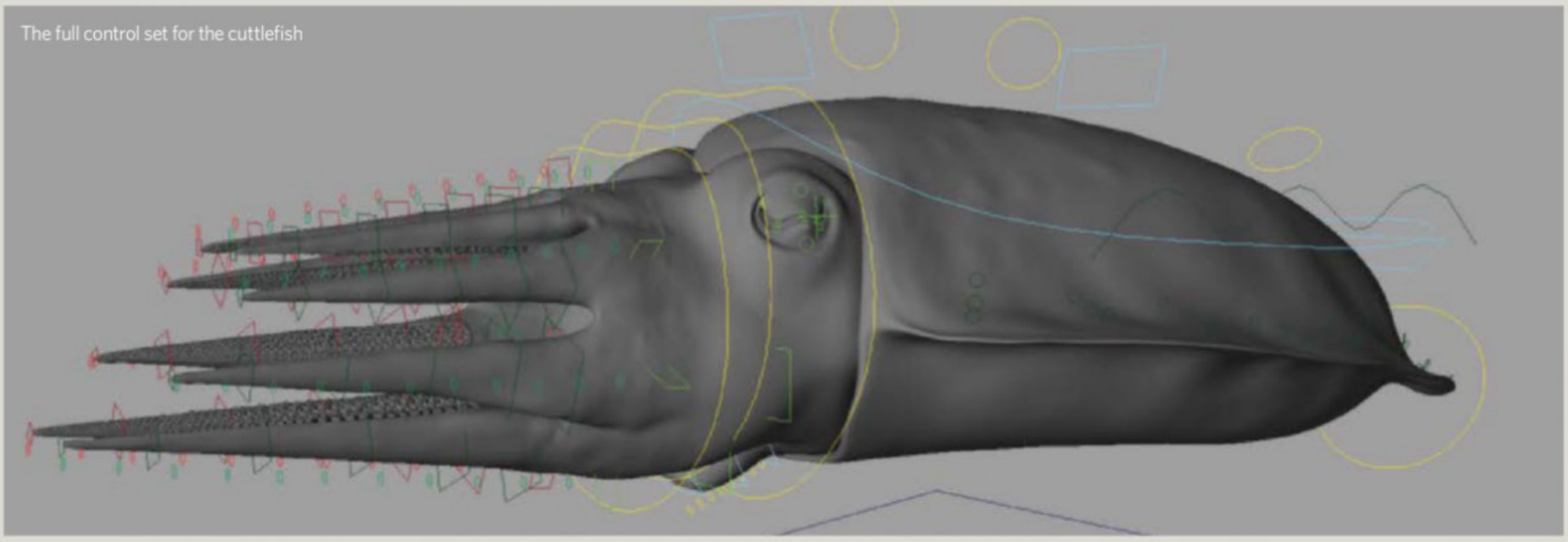
This creature clearly offers the rigger some challenges and as a result, the steps coming up will provide you with an overview of the paths I took. Be sure to check out the accompanying video tutorial, which goes through what I did in such a way that you can follow along.

Though I always talk about the importance of finding really solid reference before hitting the keyboard, I can't think of a time when it would be more vital than here. The visit I took to my local aquarium (that I mentioned in part one) stood me in very good stead, as did pouring over other video reference gathered online. You really need to get a clear feeling for how this crafty fellow can move before you even so much as open your 3D package.

Analyse the movement of the cuttlefish and break it down. What drives the movement and what is driven? Which of the movements will have to be key-framed, which can be automated and which can be simulated? In this exercise you're a rigger, but your animating side must be given voice too. The ten appendages and fin could make for a very time-consuming animation, so see which controls can be automated to speed up the process.

After analysing your reference, separate three main areas of focus: the eight arms, the fins and the mantle. The arms have to be able to curl and twist in all directions as they are used for motion; luring and grabbing prey; attracting mates; and self-defence. The fin requires a sine wave motion reminiscent of the way a flouncy skirt moves, but you need to be able to reverse this motion as the cuttlefish uses its fin to maintain motion, but also to go forwards, backwards and to turn in a circle. The mantle is the least complex of these three parts as it is the least mobile, yet it needs to have the ability to bend and twist slightly when the cuttlefish moves.

Thinking initially of the arms, then, my initial plan had been to use a ribbon rig, but after a few tests I found that it didn't provide enough control, especially when it came to twisting, scaling and adding dynamics on top. Instead, what I ended up


The full control set for the cuttlefish

with was an FK joint chain driving a dynamic IK Spline joint chain that would drive a third joint chain, which enables clean twisting and scaling. With this setup, I basically ended up with a lot of joints, but they managed to provide the degree of control that was necessary.

For the rigging of the cuttlefish, I also used a Hair System on the arms as it can instantly add a subtle, yet very credible sense that this creature is in water – a sensation that is very time-consuming to hand-animate. The Hair System essentially gives you the freedom to add a lot of action and it can produce very strong movements if required. As well as this, I also added it to the siphon and in both cases provided for it to be disabled, if required.

Regarding the process for the fins, having to hand-animate a sine wave motion would be a very laborious task. So, in order to help the animator along we'll use an expression, which could be disabled if the animator prefers, or animated on top of. I am indebted to Zeth Willie for this little nugget of an expression, which he used for a fish setup. You can find more information on the thinking behind the setup on his blog at **www.williework.blogspot.co.uk**, where you will also find plenty of other handy Maya tips and tricks.

For the mantle we'll use a modification of the classic FK/IK setup. The rig for the tentacles and eyes are very straightforward. However, regardless of which element of the rig you are working on, from the complexity of the arms to the simplicity of the tentacles, there are two key points that must be remembered. First of all, experiment, as there is never just one way to get results. Second, test your rig as you go – test the orientation of your joints and make sure there are no joints that are popping out anywhere.

Last of all, I'd like to thank Brian Escribano (**www.meljunky.com**) for allowing me to use and also supply his very useful jointSplitter.mel script. This tool does exactly what it says and does it very well.

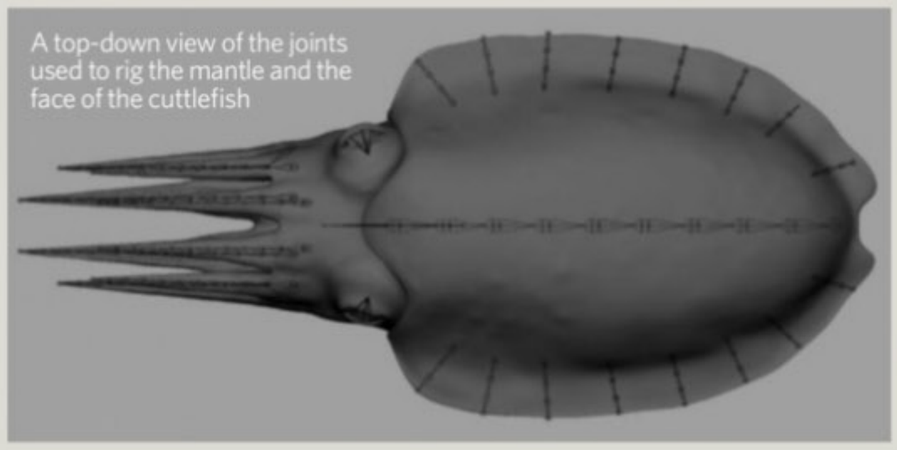
Go fishing

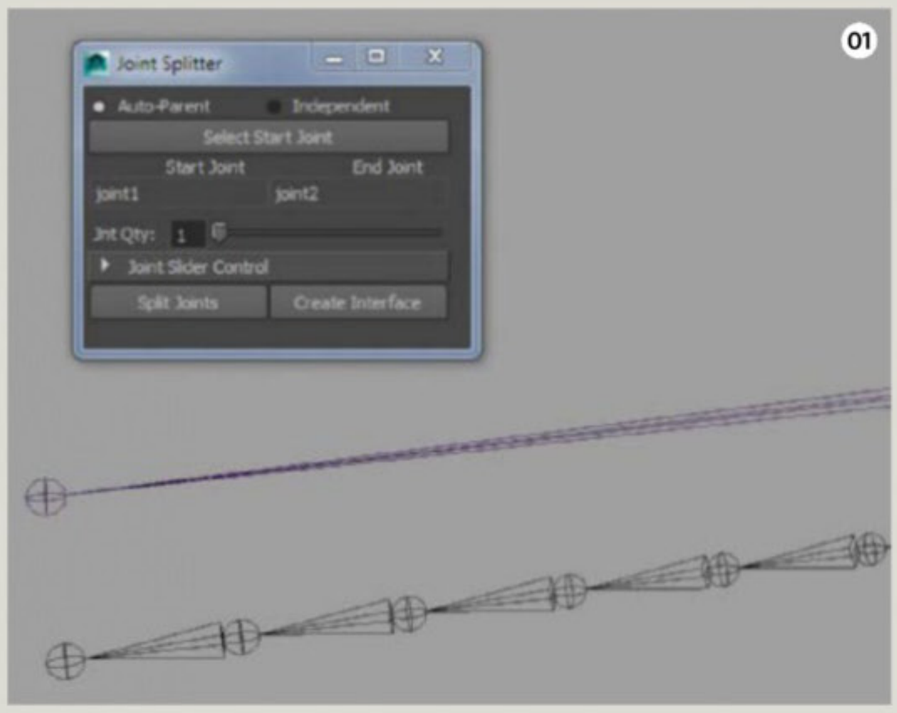
01 Build joints and controls

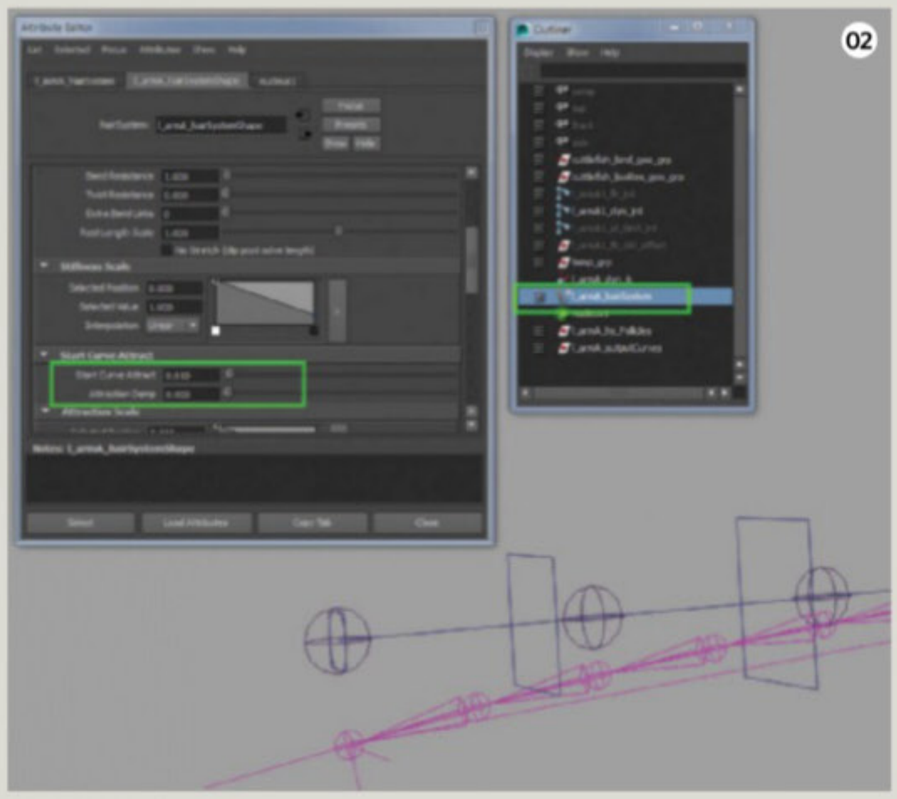
The first thing we need to do is create some joints for the arms. To do this, create a two-joint chain starting at the root of an arm and ending at the tip, then use the jointSplitter.mel script to add nine extra joints between the two. The orientation of the joints should be set so that Positive Z Rotation creates flexion. The initial joint chain should then duplicated to create the FK joint chain, as well as the extra joints that will later drive the dynamic IK chain. Using the createCircleControl.py and the createSquareControl.py scripts, create all the necessary controls for the joints. The scripts build a control for each of the selected joints, and each control will have an _offset node (used to position the control) and an _auto node (useful for adding extra features to the rig). The one thing the script does not do is to connect all the controls together, as sometimes you may not want this. Every now and again, especially with the FK joint chains, you will need to go in and do a little parenting to get the control hierarchy to mimic an FK joint chain behaviour.

02 Add dynamics to arms

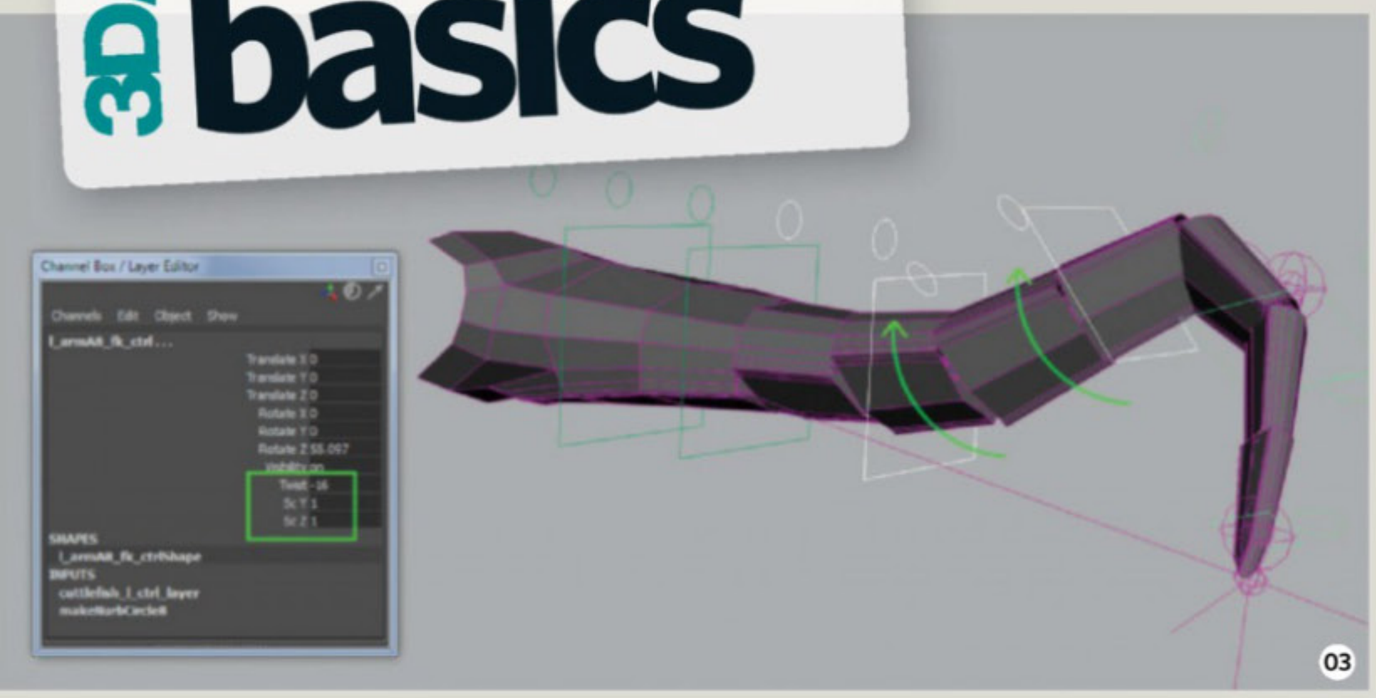
To add dynamics to the arm, use the EP Curve tool to draw a curve by point-snapping to each joint. The Spline IK tool should then be used to connect the joints with the curve. Set this curve to be a Hair System and skin it to some control joints. This allows the arm to be posed by an animator and also provides some free-flowing organic motion. The effect of the Hair System can also be controlled by playing the Start Attract Curve attribute.


A top-down view of the joints used to rig the mantle and the face of the cuttlefish





Back to basics



03

03 Include twist and scale joints

We want to be able to twist each joint, but the current setup, especially with the dynamics on top, simply won't allow this. To get over this hurdle let's create another set of joints (duplicated from the original chain) and orient-constrain the Y and Z axis of each joint to the respective joint of the dynamic chain. This means that the Rotate X attribute is now free to twist the joints from this new set of joints. This new set of joints also allows for scaling on the Y and Z axis, which is a bonus. As this set of joints is driven by both the FK chain and the dynamic chain, later this set will be bound onto the mesh.

04 Rig the face

The face should be fairly straightforward. Create a three-joint chain that will drive the majority of the motion and create controls for each joint using a createCircleControl.py script. More importantly, add an extra joint towards the front of each arm chain so later on we can deform that region and orient the base of each arm. A couple of extra joints should be introduced around the sides and the bottom of the face. Again, this is to enable us to move the mass of the face around and make it feel more organic and fleshy. The extra joints should be parent-constrained to the controls so we can both Translate and Rotate them.

05 Set up the mantle

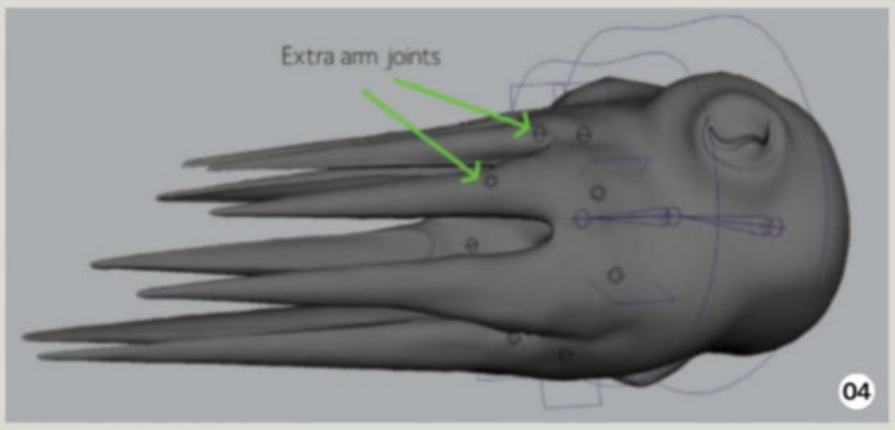
For the mantle, create an FK/IK spine setup. Like the arms, first create a two-joint chain and then use the jointSplitter.mel script to add eight extra joints to the chain. This should then be duplicated to create the FK spine that will drive the IK controls. Then, add in three extra independent joints to allow for IK movement – one at the root, one mid-position and the last at the tip of the mantle. An IK Spline should be created for the IK joint chain and the curve used to manipulate the joints should then be skinned to the three independent joints. Next, add controls where necessary using the scripts provided. To reshape the visual appearance of the controls, hit F8 to go into Component mode. This will enable us to affect the control shapes while maintaining the position and orientation of the control.

06 Add twist to the mantle

To add the ability to twist the mantle, take advantage of the Advanced Twist settings that live on the IK Spline. These will allow you to pick two controls (the IK root and the IK tip control, in this case) to drive twisting from alternate ends of the joint chain. As the IK controls are also parented under the FK controls, this means that it is possible for us to twist the mantle using the FK controls. For me, I found that following a little experimentation during the rigging process, I was mainly posing the mantle using the FX controls, so being able to create a clean twist from them was an added bonus.

07 Create the joints and controls for the fins

As we need the fins to generate the distinct sine movement, you may find it best to run a series of four-joint chains along the frill. Looking at the topology of the low-resolution mesh, we'll be able to run a series of joints along every other edge loop. Once again, the joint chains are created in the same manner as the arms and the mantle. First a two-joint chain needs to be created and then using the jointSplitter.mel script, add two extra joints to each chain. Once the joints for the left side are created, use the Mirror Joint tool with the following settings to create the right-hand side: Mirror Across: YZ, Mirror Function: Behaviour. As the joints will solely be responsible for rotation, use the createCircleControl.py script to build up all of the controls.



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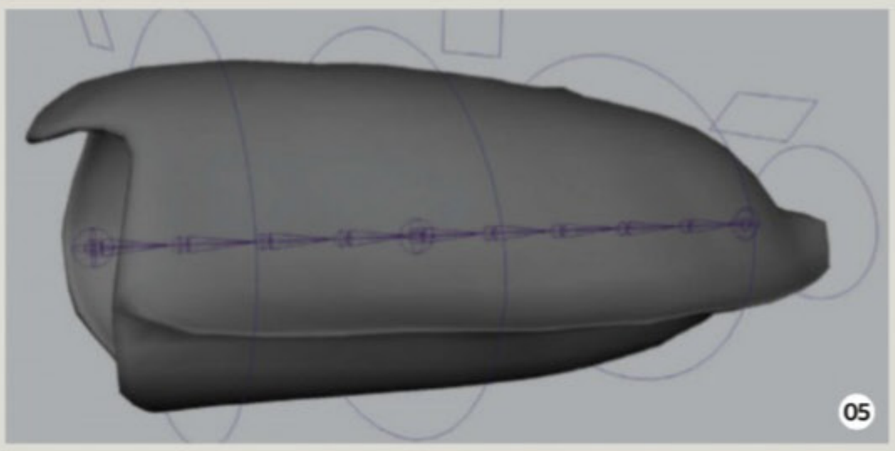
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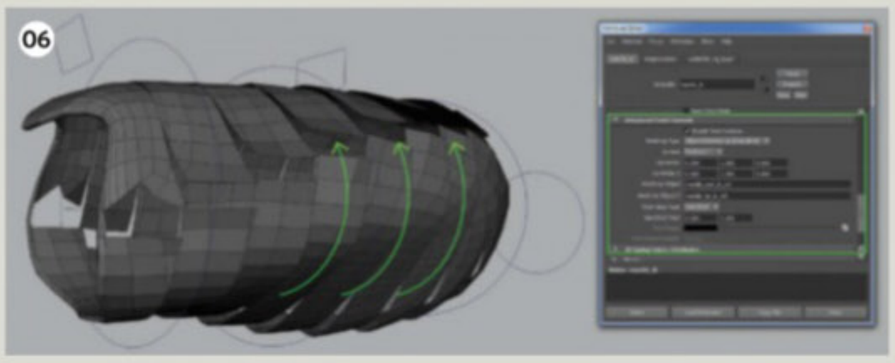
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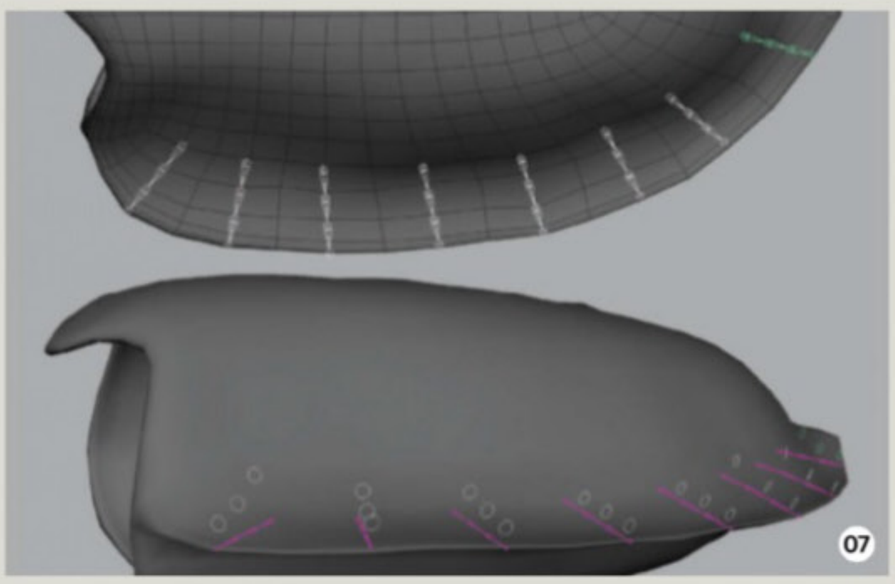
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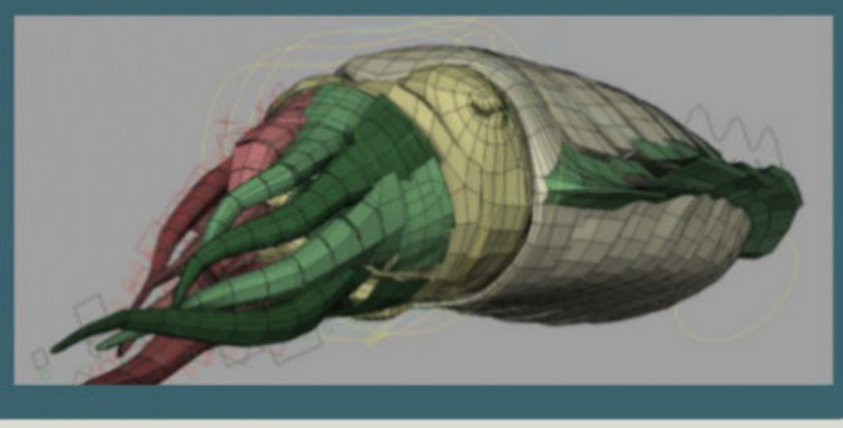
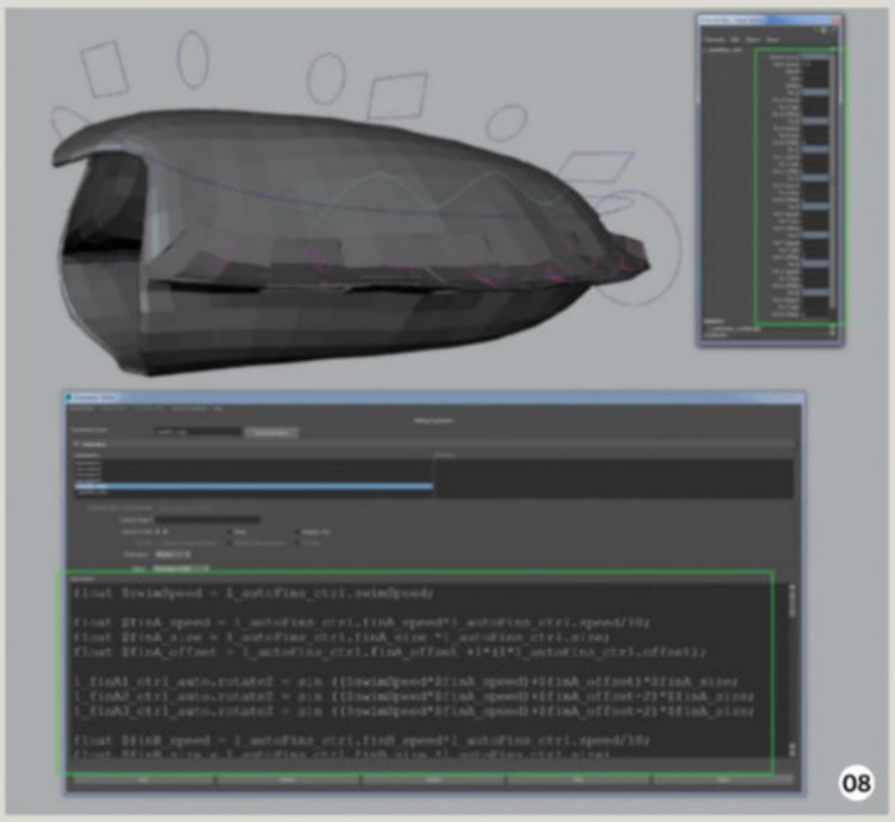
Test rigs with a lo-res mesh

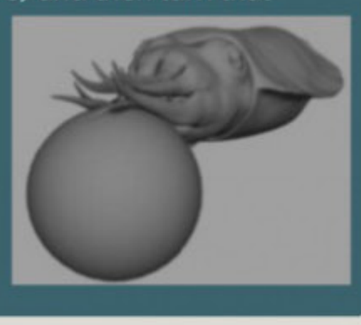
It's a good idea to test the rig as you create it as it enables you to spot any problems. To do this, take the base mesh, reduce the resolution (by manually deleting edge loops or going to Mesh>Reduce) and chop up the model where a joint intersects it by selecting the relevant faces and going to Mesh>Extract. After separating the faces, perform a Delete By Type>History and parent the geometry to the closest joint. This also provides a low-res animateable mesh that can be used when animating.

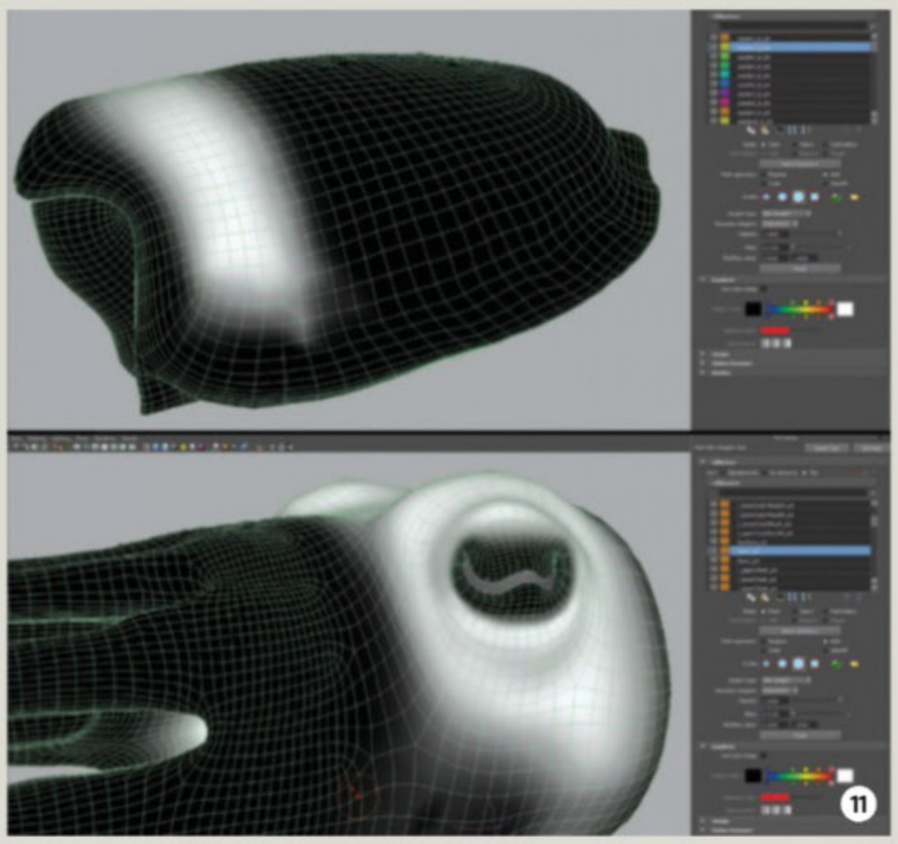


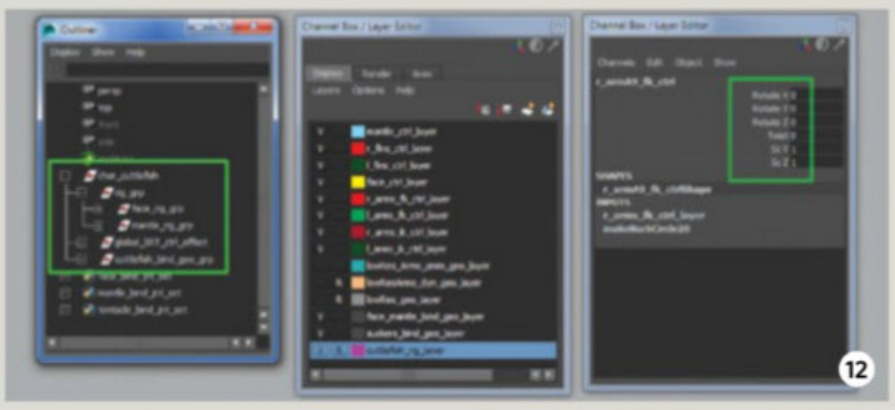


Add collider objects

As we have a Hair System running in each arm of the cuttlefish, we can use extra objects as colliders to create organic results. Simply select the hairSystem node for the arms and in the nDynamics menu, go nMesh>Create Passive Collider. Then create another object (I used a sphere) and then turn that object into a Passive Collider too. If you now animate the sphere moving into the arms or vice-versa, you should now see that they interact with each other. This method will doubtless come in very useful when we come to animating the cuttlefish next issue.







08 Use expressions

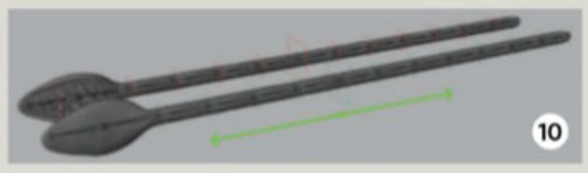
To create the sine-like movement of the fins, we could let the animator key-frame the current controls, but this would undoubtedly be a long-winded and tiresome process. To make the animator's life much easier, we'll be using expressions to drive the motion of the fins, while still enabling the animator to work on top of the automated result. Major credits must go to Zeth Willie from whom I picked up this idea. You'll find that you can use this setup in everything, from fish to ropes, or even spines. If you wanted to, you could even introduce it to the FK controls for the arms and the mantle.

09 Rig the siphon, the eyes and the mouth

For the siphon, use the same technique as you did for the arms. This is so that you can take advantage of the Dynamic Hair System to create some subtle movements. Use a smaller joint chain here (only eight) – this should be more than adequate for posing. The eyes should be kept fairly simple, with a main joint to drive the rotation of the lids (pivoted from the centre of the eyeball geometry) with three extra joints parented to it to enable you to shape the eyelid. Do this for both the top and the bottom lid. Add in an extra joint on the inner and outer corner of the eyes to make it easier to shape the eye. For the mouth, create two rings of joints that should then be parented to a single centred joint. This joint should then be parented to the head control so it follows along with the main mass of the face. All the mouth joints need to have Translation controls attached to them to enable posing. Don't spend too much time on the mouth as it will not be very visible during the animation and instead focus on more prominent parts of the cuttlefish.

10 Rig the tentacles

Like the mouth and the eyes, the tentacles should be kept very simple. As the main purpose for them is to quickly shoot out and grab prey, focus on them being able to do just that. However, you will need to think about how you can keep the rear of the tentacles hidden as the mantle is posed. Due to the length of the tentacles, they have a tendency to poke out. To combat this, first push the geometry of the tentacle back into the mantle and then perform a Freeze Transform to zero out the Translate and Rotate values. Then add a joint at the



centre of the tentacle geometry and create a joint chain running from the centre down the tentacle, and another joint chain running up the tentacle. This will enable you to curl the tentacle from two directions, which in turn allows you to keep the rear of the tentacle within the mantle as it deforms, while the front portion stays as it is. You'll also need to create an expression to automate the process of the tentacles, staying within the mantle to again make things easier for the animator.

11 Bind the geometry

Once the rig has been created, we'll start skinning. The process of skinning can be a very time-consuming step of the character set-up pipeline and is one that should not be rushed through. After all, the joint structure that we have in place will create around 80 to 90 per cent of the deformation for our mesh. We can always add corrective fixes later on, but they should only be applied on top of a properly skinned mesh. I've gone into some depth on the video about my method of skinning a character. I've also covered how I skinned the suckers and then transferred the weighting information from the face geometry over to the suckers. A quick note though – when you skin the suckers, do make sure that you only take the same joints used to skin the face. This makes the transferring of weights a cleaner process.

12 Clean up

The last and one of the most important things to do is to tidy up the rig. By doing so, we will be able to hand over an asset to the animator that will be good to go. That means we need to hide all the IK handles and the effectors. We need to hide all the IK Spline curves, the Hair Systems, any joint chains that do not need to be on show and so on. As an animator or any other user may also perform a Display>Show All, we should also lock the Visibility attribute to these objects once they are hidden. You will also want to Lock and Hide any attributes that you wish the animator not to key. For example, all the FK controls should only house Rotation attributes and maybe some Custom attributes, but not Translate and Scale. You can also use groups and Display Layers to tidy up the rig and make it easier to quickly hide and show certain aspects of the control rig. Once the rig is finished, create a quick animation to test the results and if needed, go back in and fix any issues.

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CG artist, indie game developer and Blender enthusiast. This issue Gleb shows us how to use Blender to create the worn-out fur of an old and well-loved teddy bear.

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Maya

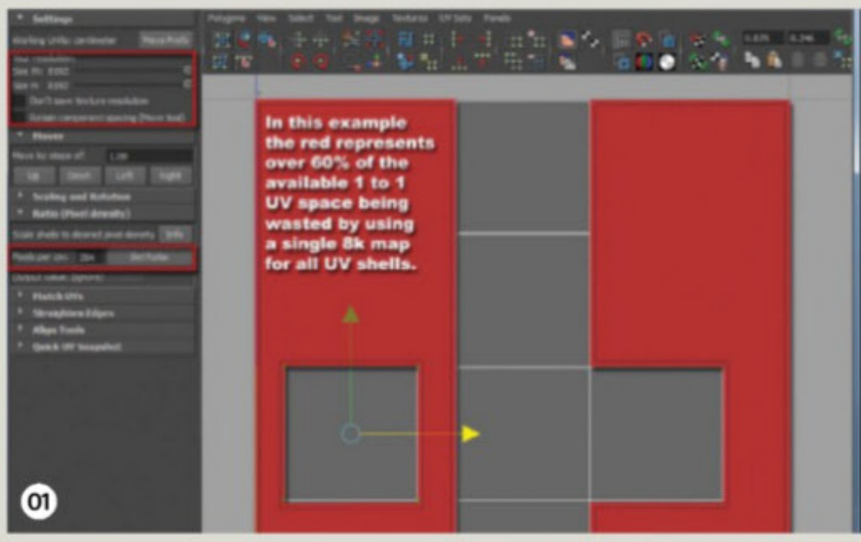
Multi-tile UV workflow

“Will a multi-tile UV workflow help my textures to look better?”

The simple answer to the above question is an emphatic yes! With the dawn of advanced texturing and sculpting tools like MARI and ZBrush, it's more important than ever to maximise your texture resolution to reach the full potential of your 3D renders. In this tutorial we will discuss the relationship between pixel density, UV efficiency and texture resolution while setting up a Multi-Tile shading network.

It's a common misconception when attempting to create higher resolution textures to think that your only option for improved quality is to export larger texture maps. Thinking like this can be dangerous to a production because not everyone has access to beefy workstations with top-end graphics cards. Not only do you run the risk of software programs crashing while trying to export those hefty 8k, 16k or 32k maps, if you do somehow manage to get them successfully saved, it's risky trying to render dozens, if not hundreds, of them in your scene when you don't have the hardware necessary to back you up. Overloading your RAM with monstrous texture files is one of the easiest ways to bring your render times to a screeching halt. There is a solution, however, and it doesn't mean investing in faster hardware. It's called a multi-tile UV workflow.

For starters, it's certainly true that an 8k texture map has more resolution than a single 2k map. However, it's also true that an equal and often greater amount of texture resolution can be achieved by using multiple 2k maps on a single object that has been broken down into multiple UV shells than that of an 8k map on an object with a single UV shell.


In this example the red represents over 60% of the available 1 to 1 UV space being wasted by using a single 8k map for all UV shells.
01

To follow along you'll need a Mel script named UVDeluxe by Erik Spellerberg that you can access at www.creativecrash.com.

growing community at www.3dartistonline.com

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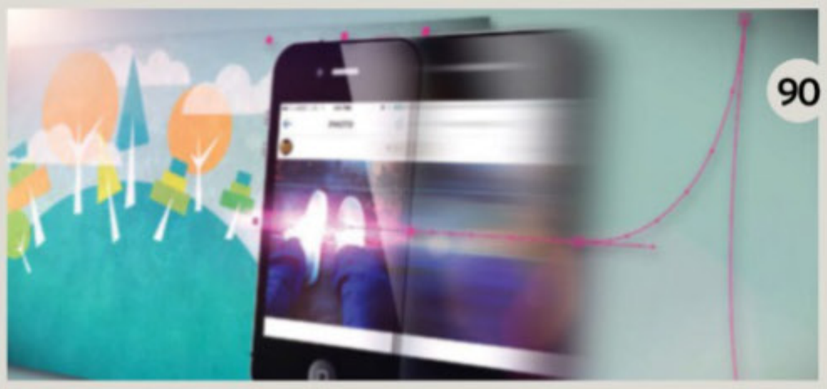

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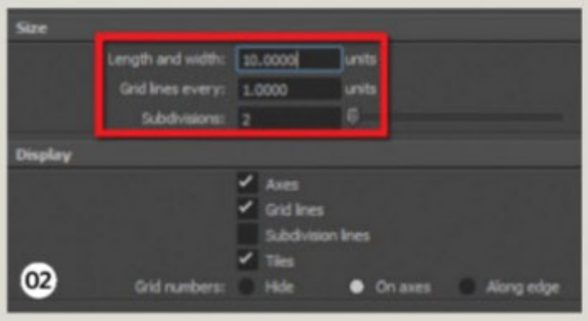


01 Find the pixel density

After opening UVDeluxe and selecting a base cube with automatically unwrapped UVs, we can instantly see the wasted texture space synonymous with packing UVs into a single shell. Using the Settings tab to set our Resolution to 8k, we then need to select one of the UV shells and enter a value of 204 Pixels Per Centimeter into the Ratio tab and click Set Ratio. If we find that the shell maintains an equal size relative to each of the corresponding faces we'll know that we've determined the correct pixel density. Had the face we selected become smaller or larger than the corresponding faces, we would know that our pixel density was off and would need adjusting until the face matched the rest.

02 Adjust Maya's default UV grid

Now we need to adjust Maya's default UV tiling grid setup using the UV Texture Editor Grid Options menu located in the View tab of the UV Editor window. After clicking the checkbox next to the word Grid, we want to adjust the Length and Width to 10 units and set grid lines to every one unit.

03 Organise UVs into multiple shells

Now that we have our UV grid set up to accommodate for multiple UV tiles and we know the exact pixel density needed to match an 8k setting (204), we need to adjust the Resolution in the UVDeluxe Settings tab to a value of 2048. Once that is done you'll need to select all the UV shells and click Set Ratio to the value of 204. Now our individual UV shells are large enough to fill the full one-to-one space of a UV tile. Arrange them horizontally left to right along the U axis, being careful to avoid overlapping. If you need to exceed the ten available tiles then just go up in the V axis.

04 Use naming conventions

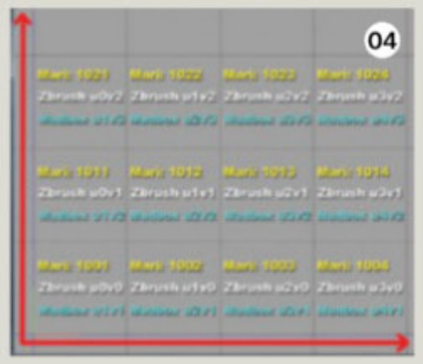
For this step we need to refer to the chart in step 4. In this graphic we can see the relationship between UV tile placement and the way different software packages read texture assignments. As you can see, both ZBrush and Mudbox use a u#v# naming convention, but ZBrush favours a u0v0 starting point, while Mudbox prefers to begin with u1v1. MARI, on the other hand, uses a purely numerical naming convention with an upwardly snaking progression. For example, once you reach ten UV tiles along the U axis it resets itself back to the beginning, but translates up one along the V axis. This ascending numerical progression can go on forever.

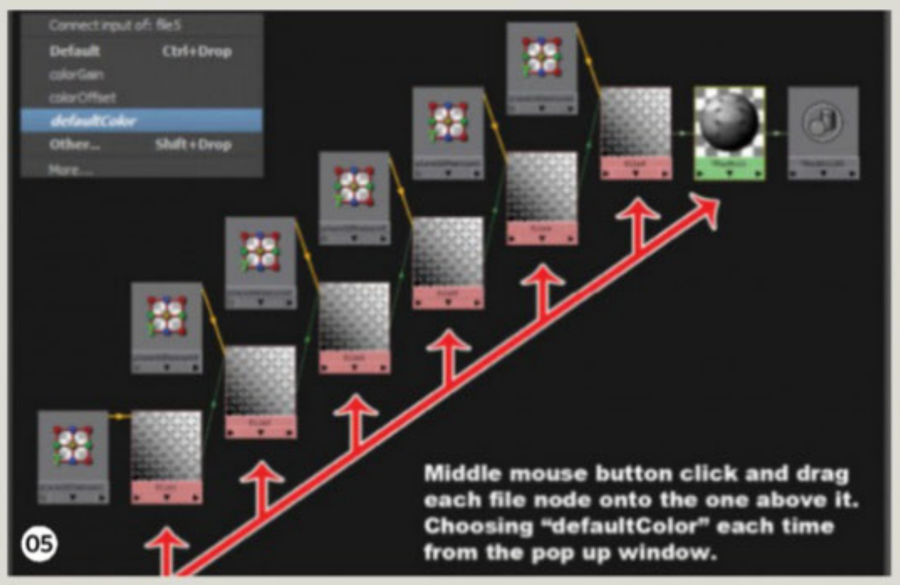
05 Build a shading network

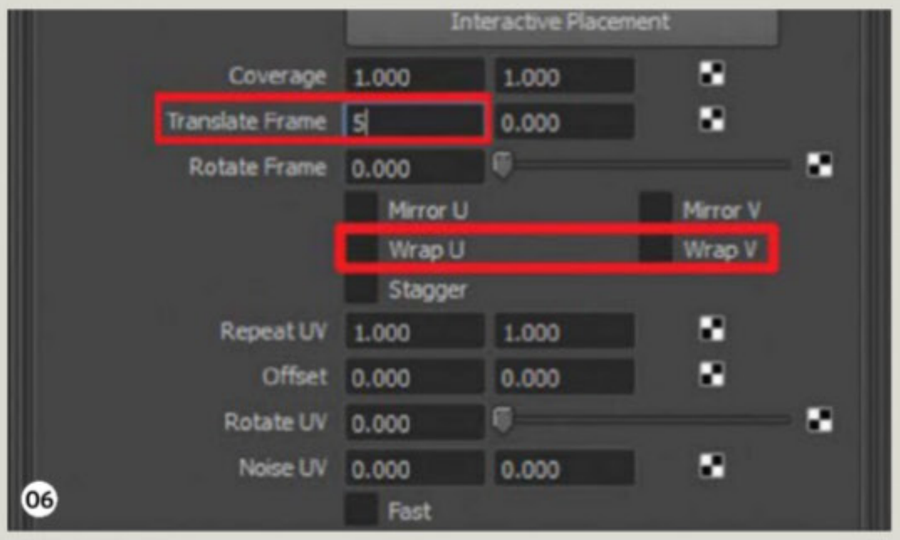
Once you've finished your MARI texture painting, you'll need to set up a shader network that supports the multiple texture assignments you've just created. Start with a standard V-Ray, Arnold or mental ray material and create six standard File Read nodes – one for every UV tile you created. Then starting from the bottom, MMB+click on the File node and drag and drop it onto the File node above it. Each time a pop-up window will open, and you'll want to select defaultColor. Once you've connected all the Read nodes, you have to MMB+click on the last one and drag it into the defaultColor value of your shader.

06 Set up proper Translation Offsets

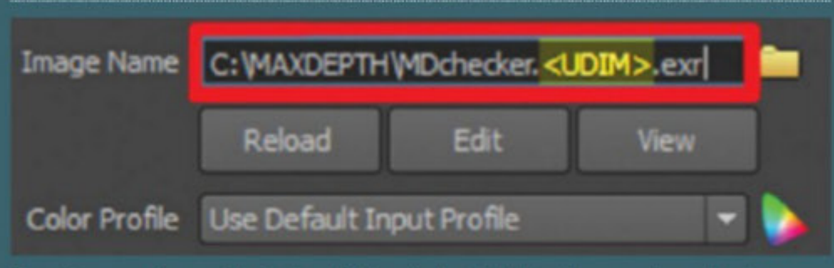
The final step in the shader-building process is to uncheck Wrap U and Wrap V, then set the proper translation offset corresponding to each UV tile created. It is extremely important to set this Translation Offset correctly, as without it your textures will render out of sequence on the object. Starting with your home u0v0 tile (or 1001 from MARI), leave the Translate Frame box set to 0, but for each horizontal tile, increase the number by 1. For example, your second tile will Translate 1, your third tile will Translate 2 and so on. If you need to go up on the V axis, just move to the second Translate Frame box and increase the value by one for each row you go up vertically.




Middle mouse button click and drag each file node onto the one above it. Choosing "defaultColor" each time from the pop up window.
05



Use <UDIM> tokens



For those of you that don't like to build shading networks by hand, there is a handy render token available that enables you to skip steps 5 and 6. When exporting out of MARI or using the Multi Map Exporter from ZBrush, be sure to choose UDIM as your numerical naming convention for your files. Simply pipe a single File Read node into your Color, Specular or Reflect channel and in the box where you assign the path directing Maya to your image files, replace the 1001 with <UDIM>. Maya will automatically read it as an image sequence and will assign your texture assignments for you.

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Blender

Hair & fur techniques

How can I create an old, worn-out look using a particle system in Blender?

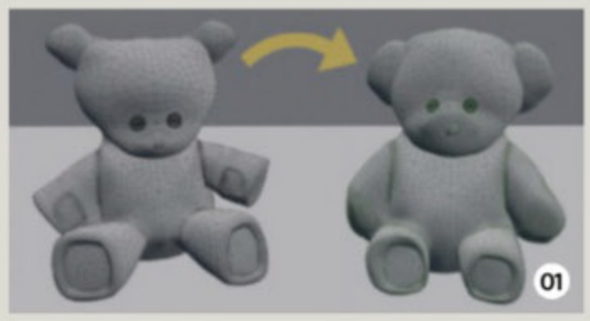
As we know, hair simulation in Blender can be used in a lot of different situations. As well as rendering human hair, it can be used to render the fur of animals, or for less conventional reasons, such as when making a lawn or a grass field as we did back in issue 67. Even in these situations the result looks realistic and believable. What makes all the difference is how you go about using the different settings. In this tutorial we're going to look at how to use the various parameters to set up a hair particle system for a traditional burlap bear. However, we'll spice it up and add a twist – our teddy bear will be old and weary, with bald spots here and there, making it an object of nostalgia.

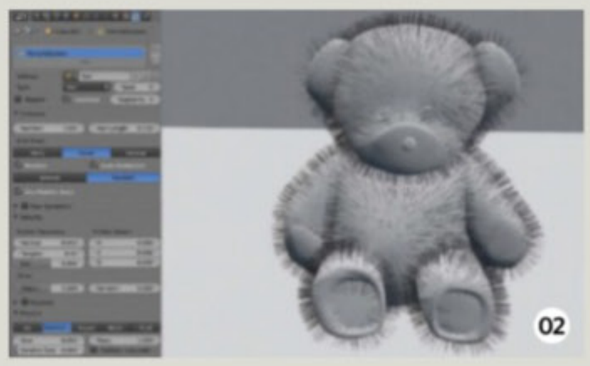
Throughout this tutorial we will explore the basic stages of hair simulation in relation to the worn fur. First, we'll prepare the model, which will serve as an emitter object and also as an underlying mesh. In the next step, our goal will be the creation of the particle system, starting from a preview version for the Particle Edit mode and moving to an advanced version for the high-resolution render. In another words, we'll sculpt the hair first and then enable the advanced settings to complete the simulation – by advanced settings, I mean Child particles, Kink and the Cycles Hair Render settings.

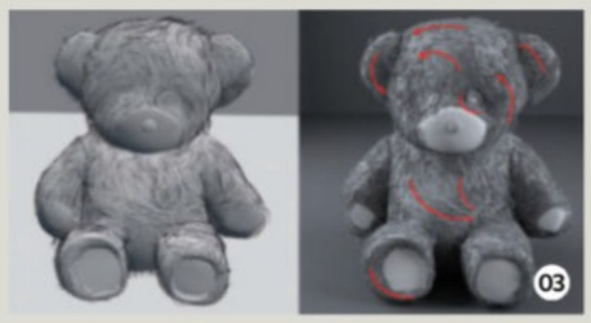
To enhance the illusion of the worn fur, we will control various properties of the simulation using the particle textures, predominantly the Perlin Noise texture.

The next stage will be the interplay between the materials and lighting. As we will be giving our material have a slightly translucent quality, the position of the light will affect the model significantly. In general, it's a good idea to set up the lighting and the basic material during very early tests because it will greatly influence the appearance of the fur.

You could tackle this project using a simulation approach – in the case of short, straight and dense hair, the Displacement modifier with a clever shader applied to it would probably be enough. Even a Normal map on its own could do the trick of simulating fur. Nevertheless, for a close-up shot of the teddy bear, as in this instance, we really should use the particle system.







01 Prepare the model

The basic mesh can be either created from scratch or modified from another available mesh. For the sake of the content-sharing principles of the open-source community, let's download a burlap bear model from www.blendswap.com/blends/view/759. This site is dedicated to Blender content sharing under permissive licenses. Open it in Blender and check what needs to be added into our main scene. Press F1 to add and select any necessary objects and use

Proportional Editing (Connected mode) to alter the shape of the model. If you want to rotate body parts around a Pivot Point, set the 3D cursor to the desired location, then press the full stop on the keyboard or select the 3D cursor in the Pivot Point menu.

02 Set up a particle system

Let's go through the stages of the hair simulation. First, we'll need to create a draft particle system and test the basic shape and properties of the hair. The next step is combing it. We'll then turn to Child particles, up the render resolution, set the Hair Render mode to Curve and then continue working on the details. After that we'll use particle textures to make our teddy bear look old. So, start by adding the particle system to the mesh. Set the Number Of Particles to 13,000 and Hair Length to 0.132 (this value obviously depends on the scale of the model). Set Emit From Faces and tick the Even Distribution checkbox to spread the particles over the surface of the model.

03 Style the hair

Switch viewport to the Particle Edit mode, select the Comb brush and start styling. The brush strokes largely depend on the desired look for the hair. One thing to keep in mind is gravity – under its own weight, the hair will likely stick to the shape of the underlying model in some places. Also, you may want to force the hair to follow the curvature of the model – in the case of our bear, the strokes will form circular patterns. The hair will almost inevitably stick from beneath the surface in some places. It can be removed with the Cut brush. Using the inverse of the Cut brush, the Add brush, hair can be added to cover any bald spots.

04 Adjust the hair's advanced settings

Once the basic shape is established, we can set a higher resolution – and then immediately regret it, because what seemed to be a decent-quality fur will suddenly look terribly low-res. This means that we need to add Child particles to push the density up and also play with the Cycles Hair Rendering settings to add resolution to individual hair strands. So, set Children to 30 (Render) and switch mode to Interpolated, as we want the Child particles to retain the shape and direction of the parent particle. Tweak the Clump parameter to imitate the plush. Set the Kink to Curl, the Frequency to 2 and lower the Amplitude to 0.075. This will add twist to the hair and break up the repetition. The last setting to take care of is Roughness, so set Uniform Roughness to 0.1 and Random to 0.2. This parameter controls how chaotic the hair will appear.

05 Control bald spots with particle textures

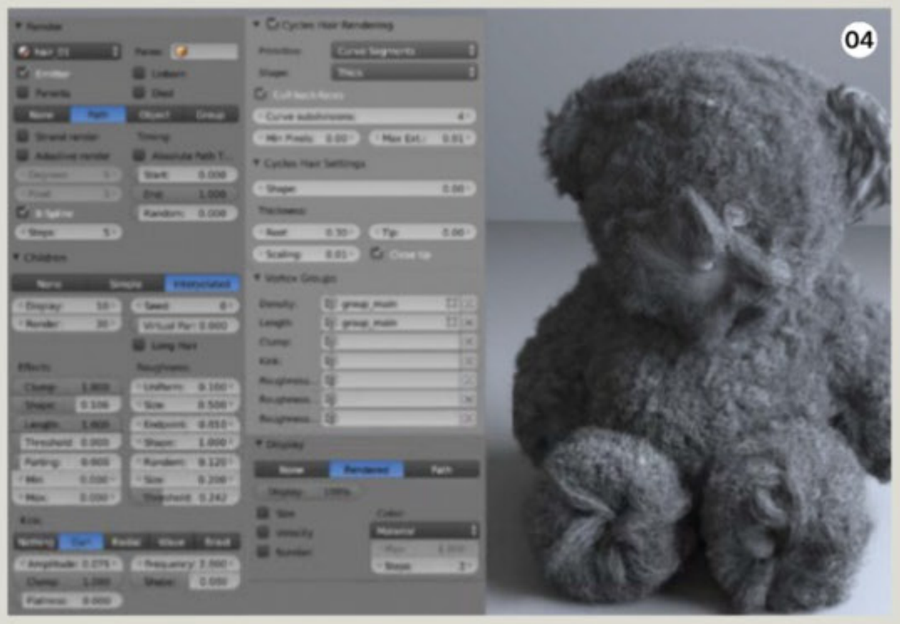
The bald spots on the model are controlled by the particle texture – Clouds type, Improved Perlin basis. More precisely, the Density parameter and also the Length are affected by it. Set the Noise mode to Hard, bump the Contrast to something like 3.2 and Brightness to 1.7 to eliminate very gradual transitions between noise values. Tweak the Offset values and Size until you strike an aesthetically pleasing ratio between the bald spots and the long hair. After that, go to Edit mode, select all vertices and assign the Weight of 1.0, then switch to Weight Paint mode and paint some areas with Zero Weight to cut the hair. To see the effect, in the Particle Settings assign an appropriate Vertex group to Density and Length.

06 Create materials

Let's talk a bit about the underlying fabric material. Create two placeholder materials and name them descriptively to make the process that much simpler. In the Edit mode, select the parts that will hold the second material (the nose, the feet and the paws) and assign it. This will be the light fabric; so a Velvet shader, tileable image texture and the Normal map plugged in. The dark fabric will be the same with exception of an RGB Curve node, which controls the Brightness of the texture. The Hair material will be a mix between the Diffuse, Glossy and Translucent shaders. The Fresnel node controls the Mix Factor between Diffuse and Glossy, and the Translucent shader is simply added on top of it with a Mix Factor of 0.074. A Procedural Noise texture (Magic) is passed through the Color Mix node, and then goes into Diffuse Color Input.

Lighting and translucency

Our bear is illuminated by an emissive plane with a blue colour set to Strength 25 that serves as a window light. Because of the size of the plane, the lighting is more of an ambient light. To accentuate the silhouette of the hair, we need another slightly smaller light plane just behind the model. This way, it will create a backlight or a rim light. As our shader has a translucent component in it, it will catch the backlighting and make the side of the bear glow. As a last touch, depth of field can be added. Create an empty Game Object and position it somewhere on the bear. In the Camera settings, set the Empty as the Focus Point, the Aperture Mode to Radius, the Blades to 5 and the Size to 0.05.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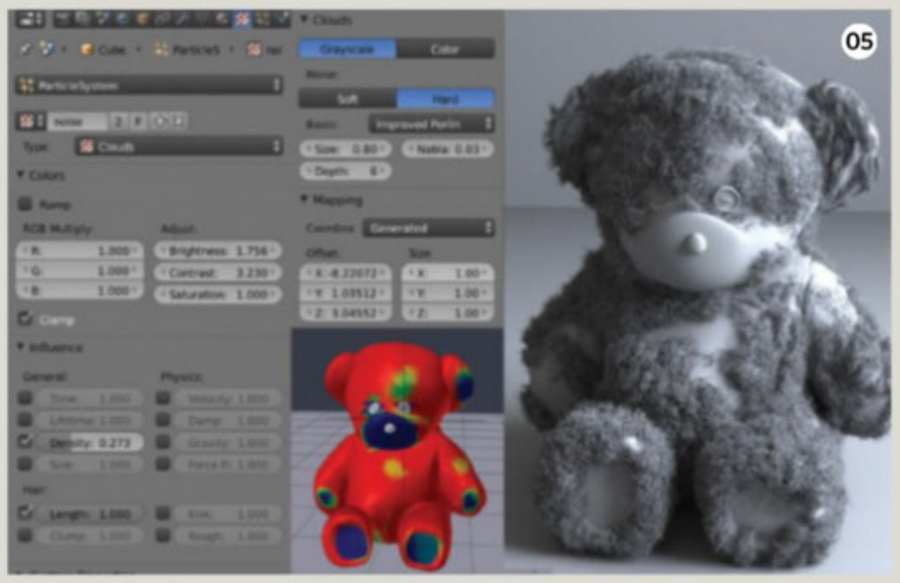
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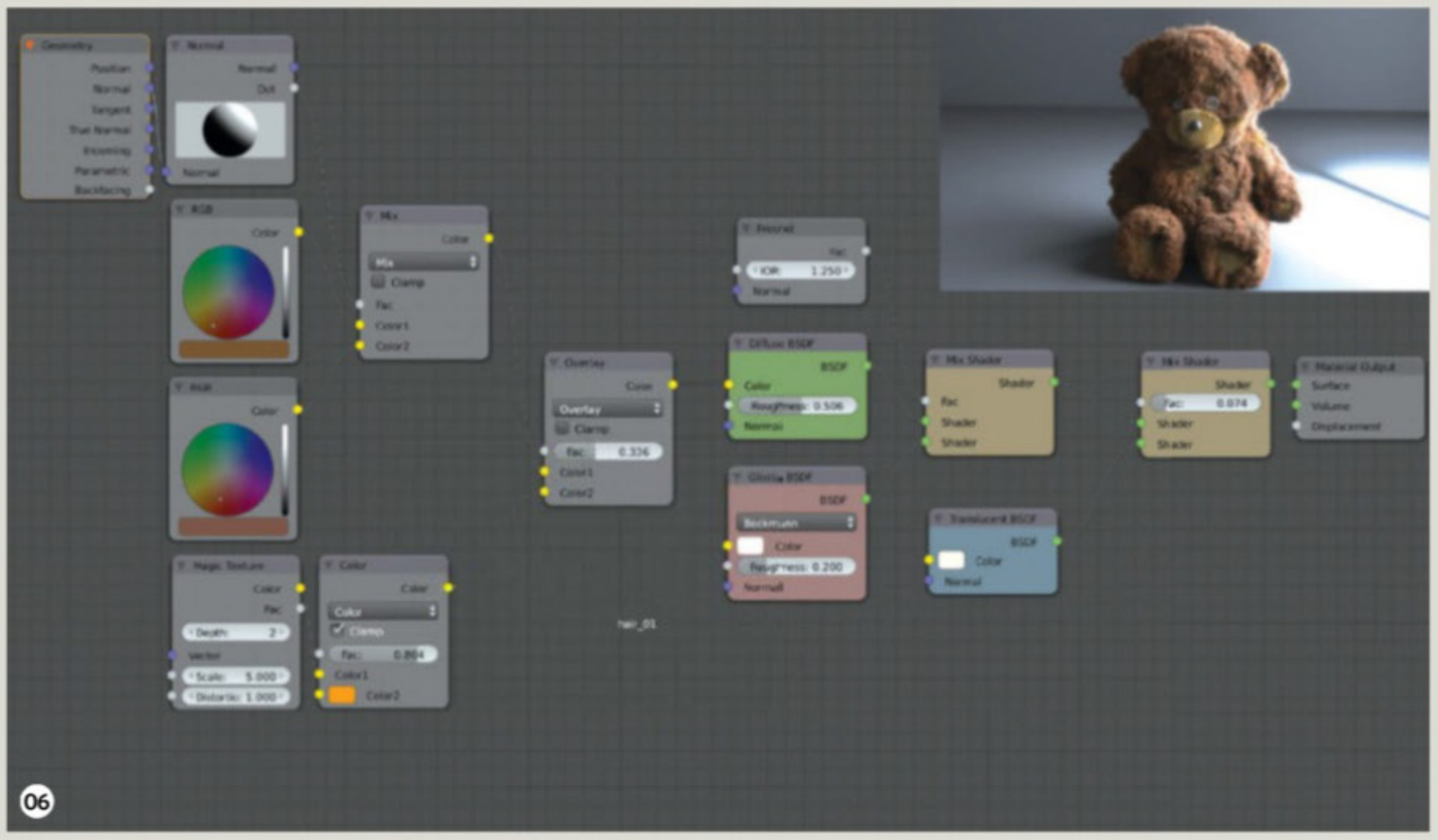
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“How can I use the Graph Editor in After Effects to make my motion graphics look super-smooth?”

The super-smooth moves of motion graphics in After Effects are an industry must for serious motion designers these days. A lot of designers try to achieve this look just using the keyframe types in the Keyframe Assistant. An Easy Ease keyframe will only get you so far, and usually adding more and more keyframes is not the answer.

Thankfully, the Graph Editor is a fantastic tool for controlling the keyframe interpolation of your animations. Keyframe interpolation simply means that there is a certain amount of time between two keyframes and that time can be interpolated to make the animation look completely different based on how the motion or distance is distributed over time.

When it comes to interpolation in After Effects there are two types – temporal interpolation versus spatial interpolation. Temporal interpolation affects how a property changes over time in the timeline. Spatial interpolation affects the shape of the path that the object is physically taking. So, when you're thinking of smooth animations you're probably noticing the contrast of the temporal interpolation.

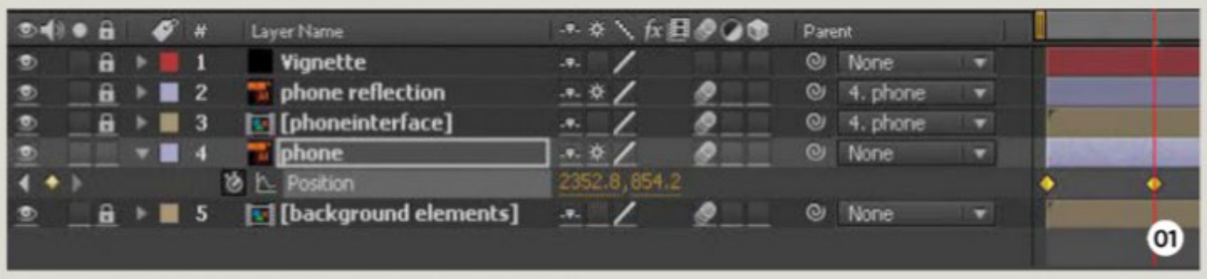
Temporal interpolation is what we will be focusing on in this tutorial, but you can use the Graph Editor to edit spatial interpolation as well.

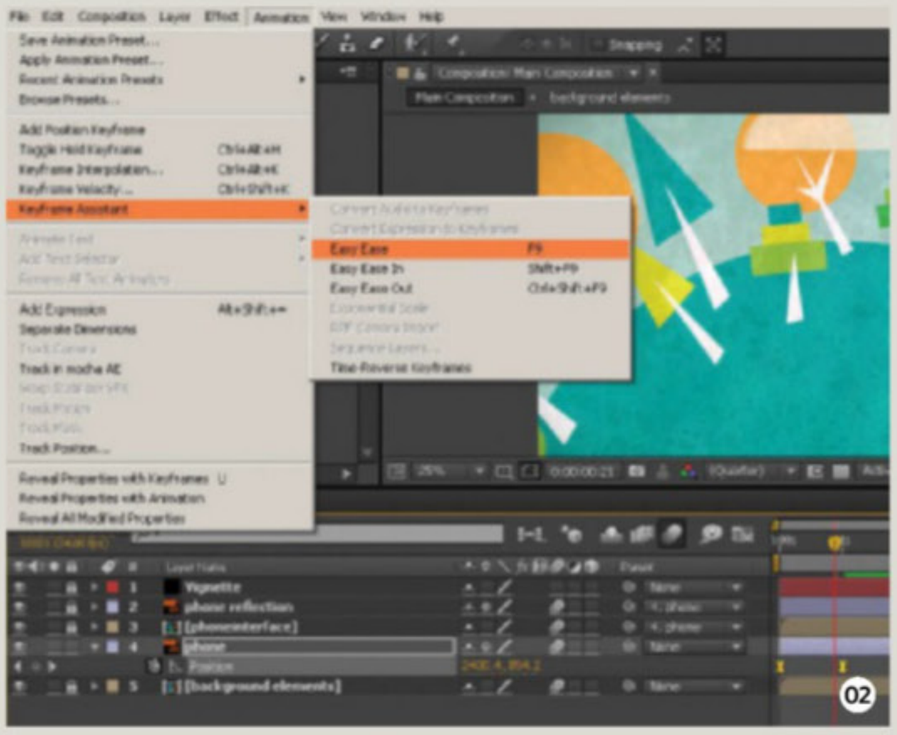
In the Graph Editor, After Effects will default to showing you the Value graph, so you'll want to switch over to the Speed graph. With this Speed graph you only see one line, which represents all the dimensions of the property. There is a direct relationship between the slope of the line and the pixels per second. The higher the line, the faster it is going and the lower the line, the slower the speed. Similarly, the steeper the line, the quicker the change in speed and conversely, the flatter the line, the more gradual the change in speed.

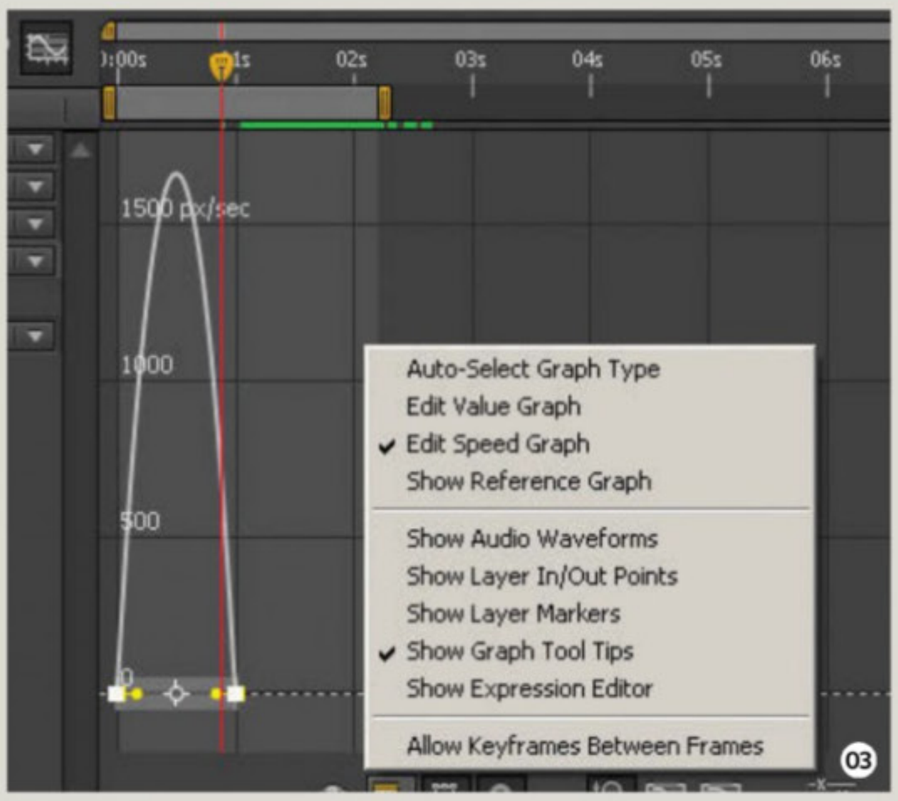
Let's set up a scenario. You want a simple position change of an object – in this case a phone – to look like it comes in from off screen quickly and then slowly eases into its final position. You'll want the line to start high, quickly drop, then level out as it comes to a stop. If you want to see the speed at any given time, you can hover over the line and it will update as you drag along the slope. Let's look at how to use the Graph Editor to take your animations to the next level.

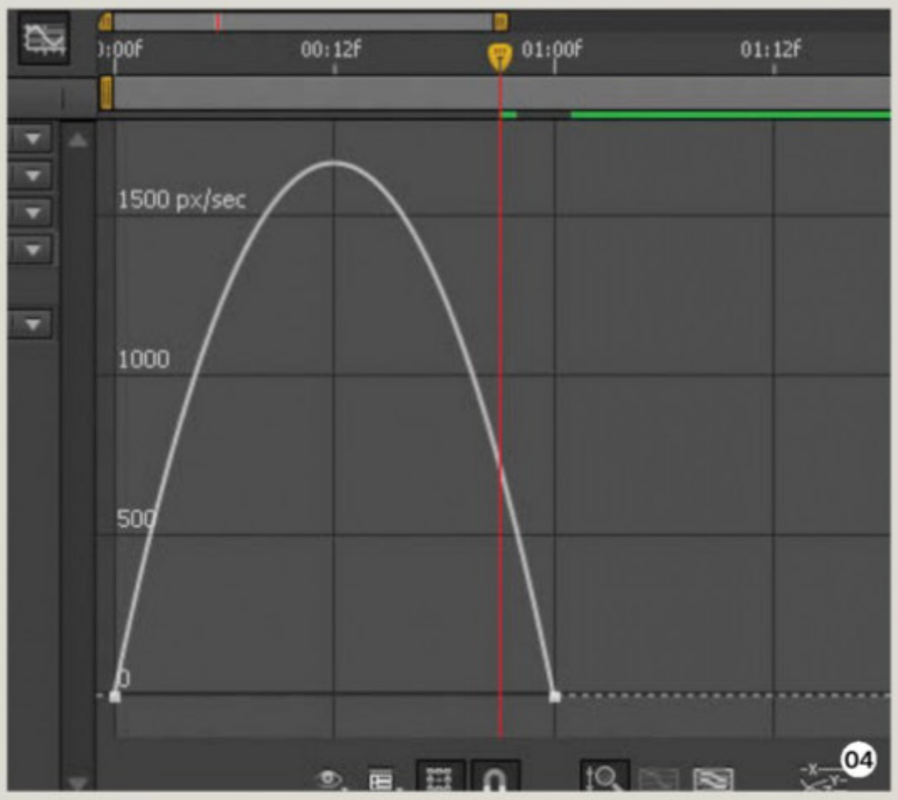
01 Set the default linear keyframes

Set your first position keyframe with the object off screen. Next, decide how long you want the transition to take place. In our case, the composition is set to 24fps. Moves like this look best when they have at least one second to complete, so set your first keyframe at the start of the composition, then move your current time indicator one second into the timeline and choose your second position. Watch the playback. You will see that there is no contrast in the motion by default. Note the dots along the motion path are evenly spaced.









02 Use Keyframe Assistant to Easy Ease the keyframes

Let's see what happens if we change the keys from the default linear interpolation to Easy Ease-style keyframes. Select the keys, go to Animation at the top, hover over Keyframe Assistant, and choose Easy Ease from the choices. Now, watch the playback. You can see that there is a little contrast in motion, but it still has a little bit of a hard hit at the end. It is important to note the dots in the motion path and how they have gotten closer together at the ends of the path. This is the way the motion is distributed across the frames of the animation.

03 Open and navigate the Graph Editor

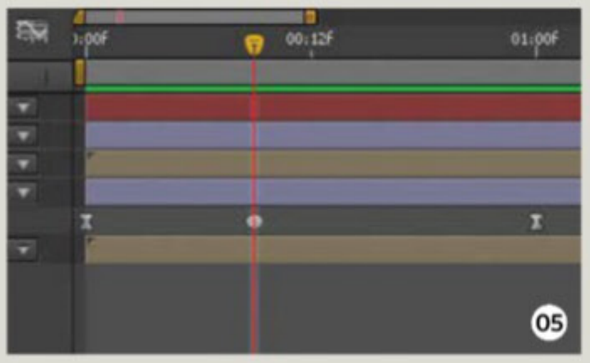
To really smooth this animation, let's take a look at the Graph Editor. Go to the top of the layer stack and in the upper-right corner you'll see the Graph Editor icon – click it. This changes your timeline to the Graph Editor, but you may not see anything if you don't have the Position property selected for the phone layer. Select it and you'll see two graphs, one for the X position (red) and one for the Y position (green). This is because After Effects opens the value graph by default. You'll want to go down to the bottom where you see all the icons and click the second one from the left (choose Graph Type>Options). Here, choose Edit Speed Graph. Now, look at the slope of the graph. It is a perfect bell curve because we have changed our keyframes to Easy Ease.

04 Use the Graph Editor

Click the second key (the bottom right point of the line) You'll see the handles appear. These handles enable you to change the interpolation to have a more extreme fast-to-slow movement. Pull the second handle back to the left while holding Shift (holding Shift will keep the handle from going at an angle and causing undesirable results). Push the contrast even further by doing the same thing to the other side of the graph. This will cause a sharp point in the graph. Now, watch the playback. This is much better, but what if you want it to look even smoother? You can't make the graph any more extreme at this point, but we can add a special keyframe to do this.

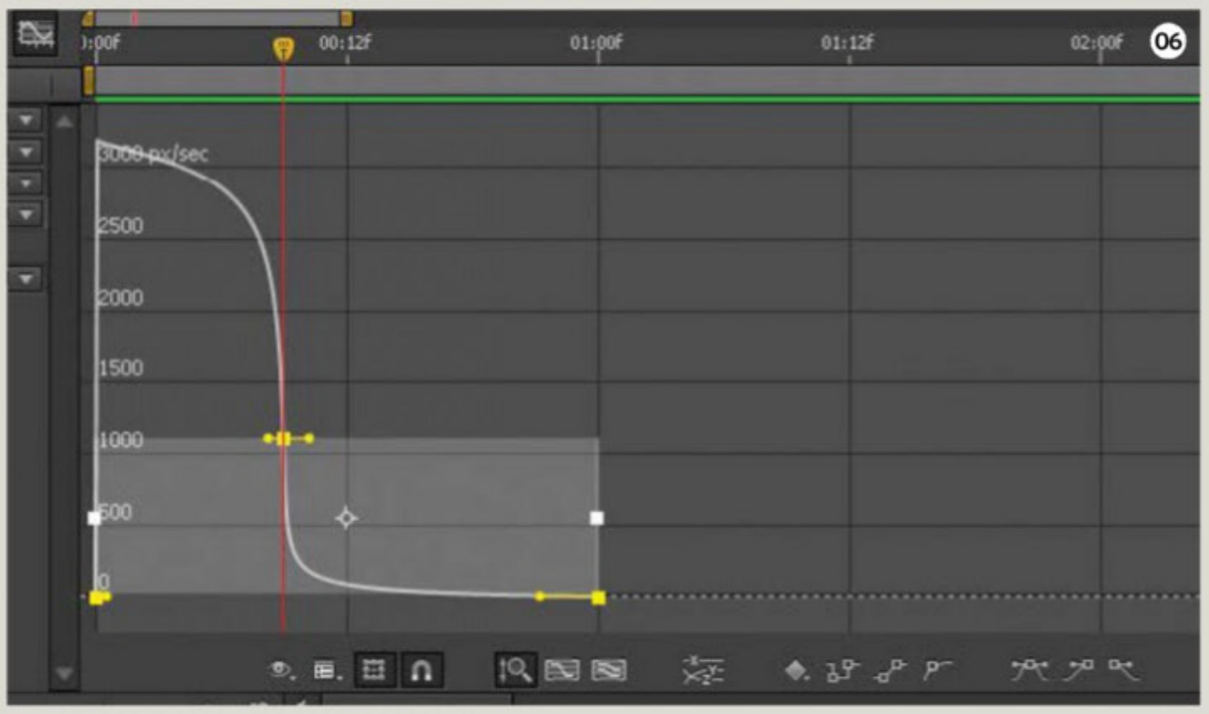
05 Add an Auto Bezier keyframe for a super-slow ease in

Click the Graph Editor icon again to jump back to the regular timeline. Scrub to about the seventeenth frame in the animation and set another key at this point. The phone should be almost to its destination, but not quite. Now if you watch the playback it will look really strange because the keyframe added comes in as an Easy Ease. To fix this, Cmd/Ctrl-click the key twice to make it a round Auto Bezier key. Now here's where the magic happens. Move this key back about seven to ten frames, then watch your playback. It should now be an incredibly smooth transition.



06 Viewing the new slope in the Graph Editor

Now if you switch back over to the Graph Editor you will see a slope that looks much different to how it was before. This slope will have your Auto Bezier keyframe right in the middle of a significantly steeper drop. This type of shape will enable your phone to come in extremely fast, then slide in very slowly for a few more frames.



Motion path dots

When changing the temporal interpolation of the position property, it is important to note the little dots along the motion path in the Viewer. Their spacing has a direct relationship to how the speed of the object will be calculated across the frames of the animation. Dots close together indicate a lower speed while dots that are farther apart indicate a faster speed.

If Apple made a magazine

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Incredible 3D artists take us behind their artwork

Artist info

Pablo Muñoz Gómez

3DArtistonline

Username: Pablander

Website
www.pablander.com

Country Australia

Software used
ZBrush, Photoshop

“Give purpose to your lighting – use it to set the mood of your piece or to define the shapes and volume. In this image, I placed my main light source behind the character to enhance the fur and to make him stand out from the trees with a glowing outline”

Lost Creatures 2014

I found an old sketch of a series of images I was working on a while ago called *Lost Creatures* and I thought it could be improved. I wanted to illustrate the moment just before the creature realises that you're there, that very instant before it knows it has to run away. I really enjoyed working on this image, jumping back and forth between 2D and 3D.

The improvements to the fur shader are quite impressive

MODO 801

We explore the numerous new features found in The Foundry's latest update to its all-in-one tool

REVIEW BY Mike Jagodzinksi, freelance 3D artist

Since Luxology became a part of The Foundry, everyone has been curious as to just what the merger will bring to MODO. Thankfully, committed users of MODO will be absolutely astounded by the sheer amount of updates and additions that 801 has brought to the table.

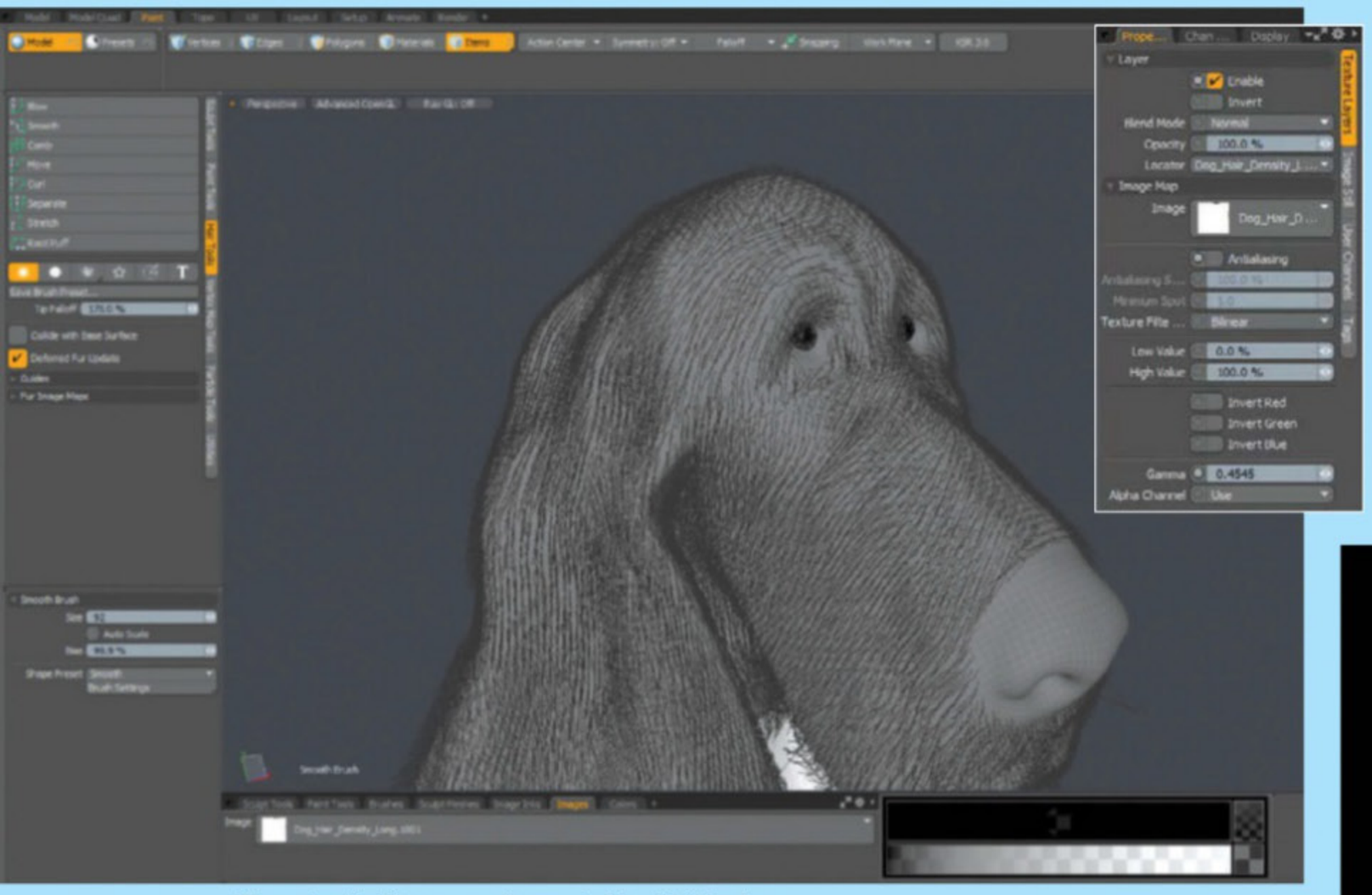
Upon loading MODO, we wanted to dig into the newest features as quickly as possible. Instead of modelling and sculpting a specific model for this review, we picked up a dog model at an online retailer. After some minor touch-ups to the model, the next step involved in the process was UV unwrapping.

Anyone that has used MODO's UV tools in the past will already know just how good they are. Yet in MODO 801, the improvements to speed on denser meshes and the addition of two new unwrapping methods made the whole process go even more quickly than usual. MODO 801 also comes ready out of the box to deal with multiple UDIMs, so anyone that textures using Mudbox or MARI will be very pleased. In our case we were using MARI alongside MODO.

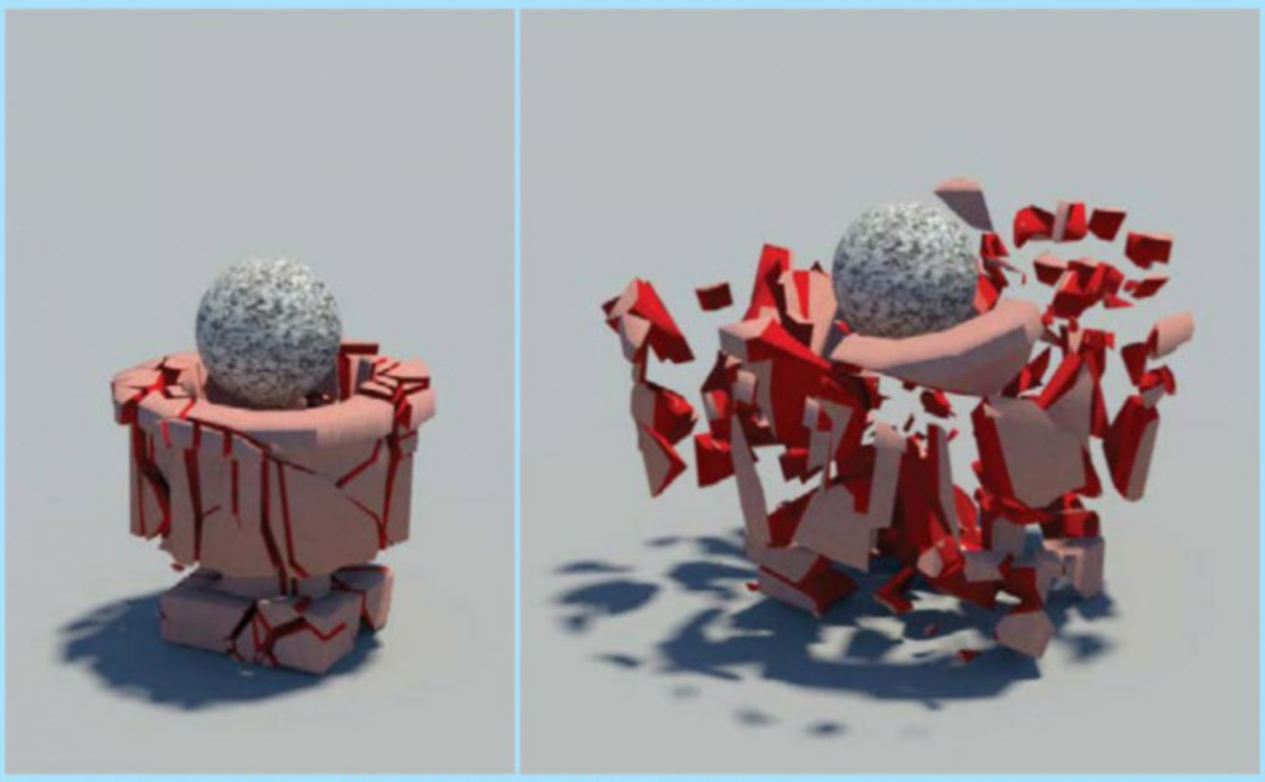
Once the textures were complete, we wanted to test out the Node Shading system. Since we only had a few texture maps it was quite simple to add them into the schematic workspace. Like before, you still need to add a base material into the shader tree and then drag and drop into the workspace. In the simplest form, plugging in texture maps for diffuse or specular into the Material node was simple and you can easily adjust the settings.

For those of you that are eager to work on more complex things within in the Node Shading system, it's become far more user-friendly. You can use procedurals as well as texture maps to make custom materials to your heart's content.

As my textures were complete at this point, it was time to move onto creating the fur. To do this, all I had to do was add a Fur material to the shader tree. I wanted to style the fur so I needed to use either the hair guides or the new Vector Map option. I ended up using the guides to groom the hair due to some minor issues I ran into using multiple UDIMs. For the most part, however, the improvements to the fur shader and the hair tools were very welcome. With numerous options within the shader itself, you really



The system itself seems much more stable with this release



Here are a few shots of the new Mesh Shatter using dynamics in 801

shouldn't encounter many issues at all when creating fur of any kind.

At this point, everything was ready to start rendering using MODO 801's new rendering additions. This was by far the easiest portion of the project, especially when using the preview renderer to set up lights and environments. The additions to the render engine have been well thought out, with the overall speed of the renders improved noticeably, even with the fur included.

Overall, my hat is off to MODO's development team and the testers. It's really great to see a program we've used for such a long time grow as this one has over the last few releases. Along with improved snapping and the addition of mesh shatter, this is simply the best version of MODO yet.

Committed users will be pleased to see many features have been updated © Steve Barrett

Essential info

Price: £999 / $1,495 US

www.thefoundry.co.uk/products/modo

OPERATING SYSTEMS

- Windows, Mac, Linux

OPTIMAL SYSTEM REQUIREMENTS

- 2 GB RAM
- 2 GB available hard disk space
- Mouse or pointing device, including pressure-sensitive tablets or 3Dconnexion 3D mouse
- OpenGL 2.0 accelerated graphics, at least 1280 x 800 resolution
- Internet connection required for product activation and to access online videos

The new updated fur shader on one of the mesh presets

The good & the bad

- ✓ Rendering enhancements
- ✓ Snapping
- ✓ Node Shading system
- ✓ Updated hair and fur shaders
- ✓ General stability
- ✗ Node Shading system has some limitations
- ✗ Still has some issues with the referencing system
- ✗ Minor issues using several UDMI's with the vector fur guide system

Our verdict

Features	9/10
Ease of use	9/10
Quality of results	9/10
Value for money	10/10

"With this powerful new update, MODO is becoming a truly strong contender in the 3D market"

Final Score 9/10

Using the new Pattern tool, you can quickly instance a model with over 20 million points to showcase different materials

KeyShot 5

The new release from Luxion offers various new features, from a UI overhaul to a built-in community resource

REVIEW BY Jerod Bogh, character artist for HIVE-FX

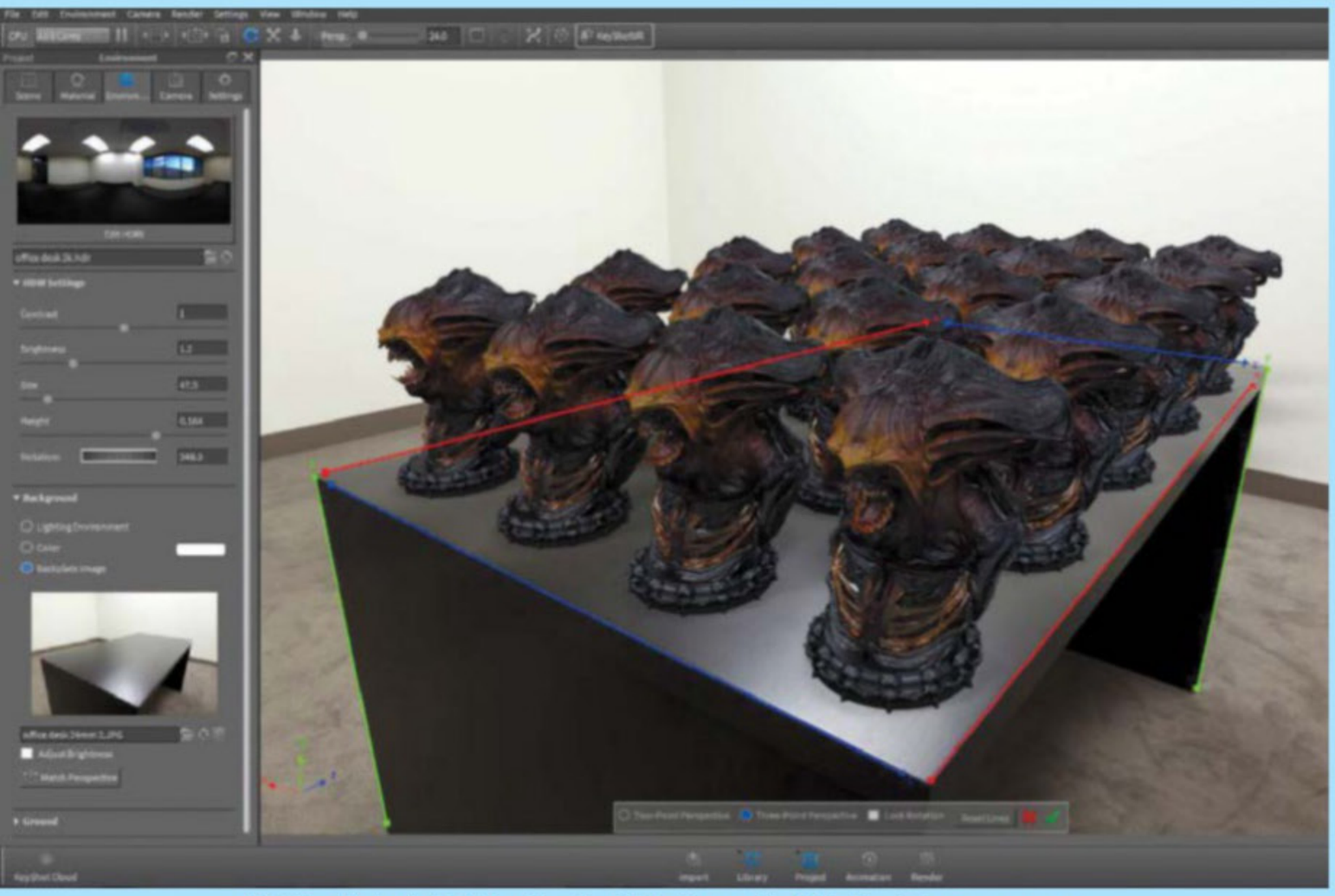
KeyShot is really bringing the heat with its latest instalment. What should be immediately apparent to any experienced user is the new spring in every step. Large scenes load faster, shadows calculate quicker with more accuracy and it crunches through most renders at what feels to be twice the speed of the previous version.

The overhaul on the UI is a welcome addition and should please both veteran users as well as newcomers by adding many requested enhancements. These include the new Favorites tab, constant access to the camera's perspective angle and easy CPU core access for on the fly performance control, streamlining an already fast rendering workflow with extra efficiency by putting all the right settings at your finger tips.

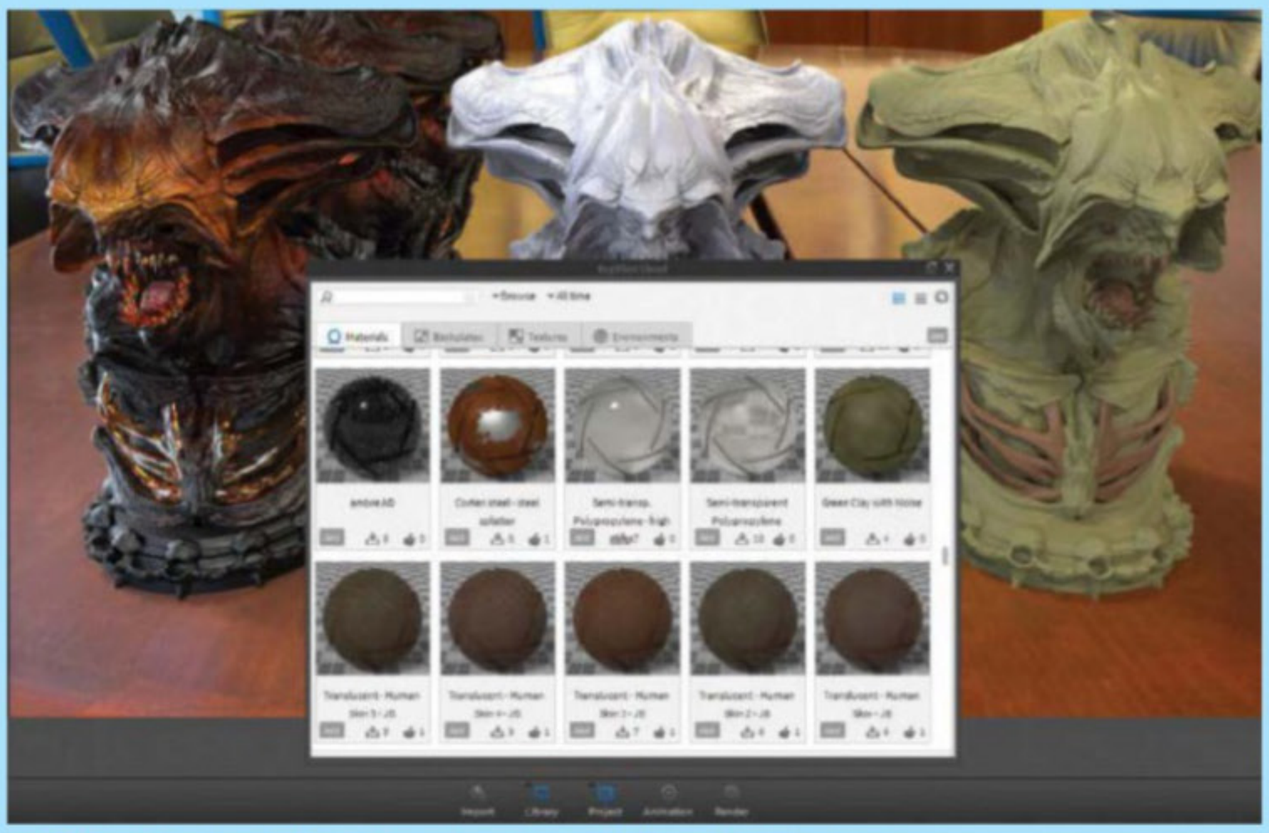
Luxion has a track record of really listening to its users by regularly implementing highly requested features, or even solving problems with new tools we didn't even know we needed. The new Pattern tool is the perfect example of this. With previous versions, if you wanted to clone an object your only choice was the simple Duplicate option, which usually resulted in massive file sizes. In version five the Pattern tool introduces KeyShot users to the power of instancing. While the idea of instancing an object throughout a scene isn't exactly a new one, this approach enables users to render billions of points at a time. Each instance retains its individuality by giving users the freedom to change materials, translation/rotation/scale, textures and custom labels per instance. Need to show a client some material options or do a quick colour study? Using the Pattern tool will make short work of that, all with zero file-size repercussions – no matter how dense the object or how many instances are generated. This makes KeyShot's take on instancing not only powerful, but very fresh.

As for backplate images, they can often be a challenge when you don't have access to the original image's meta data, such as the lens focal lengths, forcing you to eyeball the scene. With KeyShot 5's Perspective Matching feature, however, users now have the ability to plot three pairs of axis lines guiding them to an approximate calculation of the original perspective and focal length.

Integrating a model into the scene has also never been easier in KeyShot. In side-by-side comparisons of the same scene running in both version four and five, you should notice a



Matching the backplate's focal length with the Perspective Matching feature means easy integration into shots. In this image it was paired with the Pattern tool to fill out the desktop



KeyShot Cloud will surely be a hit among those looking for new additions to their materials library or users that want to share their custom creations

pretty significant improvement in shadow quality and in the speed that the shadows manage to res-up overall.

Then there's the introduction of KeyShot Cloud. For most, the core of the KeyShot experience is centred around its drag-and-drop nature – dragging physically accurate materials right onto objects with ease; instantly dropping new HDR environments into the scene; and having a large library of materials at your fingertips. This wide selection of materials is about to be exponentially expanded upon with KeyShot Cloud, the new user-based community repository. With KeyShot 5 anyone can upload and share their latest material creations, backplate images and even full-HDR environments – a feature that's usefulness will become very apparent in the first five seconds of use. There's an integrated Search function as well as a Like counter, letting fellow users show their appreciation.

Finally, while KeyShot has always come equipped with a healthy library of HDRs to pick and choose from, it's always seemed to be missing a rather important feature – Sun and Sky controls. Luxion must have heard the outcry because version five treats us to a new Sun and Sky system seamlessly built right into the existing HDR Editor. It's just one more addition to what is surely the most rewarding and robust version of KeyShot yet.

Essential info

Price: $995 US (approx. £591)

www.keyshot.com

OPERATING SYSTEMS

- Windows XP or later
- Mac OSX 10.6 or later

OPTIMAL SYSTEM REQUIREMENTS

- At least 2GB of RAM
- Minimum 2GB hard disk space
- Display resolution 1024x768 or greater
- Any graphics card
- Internet connection for activation

Editing the Sun and sky to get realistic outdoor shadows is a breeze, with the controls built right into the existing HDR Editor

The good & the bad

- ✓ Everything feels a lot cleaner, leaner and meaner
- ✓ New Pattern tool provides users with instancing options
- ✓ Built-in community resource sharing via KeyShot Cloud
- ✓ Integrating models into a scene is easier with Perspective Matching
- ✓ Sun and Sky system
- ✗ No support for Displacement maps yet
- ✗ Pattern tool could use some Scatter controls for added variation

Our verdict

Features	9/10
Ease of use	9/10
Quality of results	9/10
Value for money	9/10

"KeyShot 5 is a speed demon, which easily makes it a must-have for any digital artist's arsenal"

Final Score 9/10

Hewlett-Packard Z1 G2 all-in-one workstation

HP's latest Z1 G2 all-in-one workstation boasts much more power than its predecessor, the Z1

REVIEW BY Orestis Bastounis, technology writer, UK

When HP launched its first Z1 workstation two years ago, we found it to be an exceptional piece of computer hardware engineering, since it's the only all-in-one that's designed so the user can easily open it and upgrade its internals. As a workstation for day-to-day studio use, however, it was more limited.

With this second version, HP has expanded the choice of graphics cards and offered more up-to-date processors, faster wireless networking and more internal storage. As such, the Z1 G2 competes with traditional workstations and makes a great addition to a tidy studio setup.

You can configure the Z1 G2 with an NVIDIA Quadro K4100M, K3100M, K2100M or K600M graphics card. Xeon E3 processors are available, with up to 32GB of ECC DDR3 system memory. The option of a 20Gb/s Thunderbolt 2 port has now been added for connecting to super-fast external storage arrays, such as the Pegasus R2.

As before, to open up the Z1 G2, the entire unit has to be pushed backwards and lowered, then two latches flipped open. The screen pops up, with the components neatly laid out beneath. The 400-watt PSU, graphics card, main fan assembly and 3.5mm storage caddy can be removed with attached handles. The memory slots are easy to access, but the CPU heatsink is screwed on tightly, and cannot be changed for a desktop CPU. There are also two mini PCI-Express slots. The graphics card uses an MXM connector, which unfortunately restricts future upgrades.

HP sent us a Z1 G2 that had almost the highest possible specification – a 3.4GHz Intel Xeon E3 1245 quad-core processor, a Quadro K4100, a 256GB Micron SSD and an Intel 7260 802.11ac wireless adaptor.

The K4100M is a powerful GPU, with 1,152 shaders and 4GB of on-board memory. Results were excellent, with a Cinebench 15 OpenGL frame rate of 107fps – higher than the Scan 3XS GW-HT30, which has a desktop Quadro K5000 graphics card. The CPU test gave a score of 661 – better than desktop Core i7 processors. SPECViewPerf scores were on the same level as some desktop workstations.

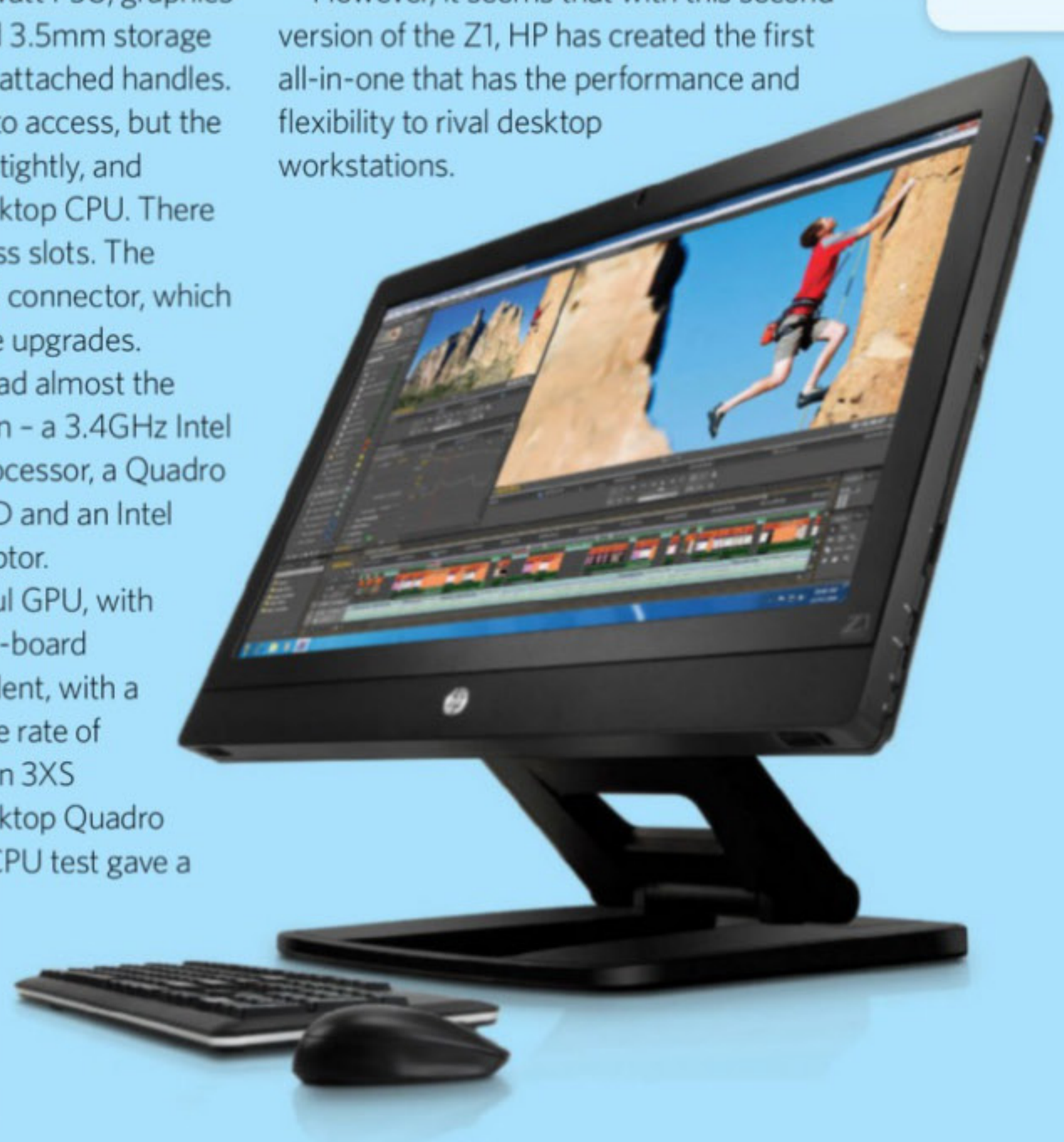
The chink in the armour of the Z1 G2 is the practical limit of four cores. Xeon E5 processors are not available, so it's slower in heavily multi-threaded software, such as rendering in 3ds Max with mental ray, where workstations equipped with eight or ten-core processors raced ahead. Four minutes 28 seconds to complete the Underwater test is by no means a bad result though.

A special mention goes to the display built into the Z1 G2. We recorded a maximum brightness level of 460 cd/m2 – the highest we've recorded using a Spyder4 colorimeter, and this overall image quality is obvious from the moment you start using the Z1 G2.

It manages 100% sRGB coverage, 84% AdobeRGB and 76% NTSC. Although professional-grade displays achieve better results, the brightness deviated by no more than 4% around the edges.

Including the stand, the entire unit weighs 21.3kg and the procedure for lowering the screen is clumsy, requiring a really hard push to move the screen. Most of the ports are inaccessible unless the unit is lowered upright.

However, it seems that with this second version of the Z1, HP has created the first all-in-one that has the performance and flexibility to rival desktop workstations.



The Z1 is an all-in-one designed around 3D content creation

The display in the Z1 is bright and capable of accurate colour reproduction

Essential info

Price: £4,100 / $7,070 US

www8.hp.com/us/en/campaigns/workstations/z1-g2.html

OPERATING SYSTEMS

- Windows 7, Windows 8.1

TECHNICAL SPECIFICATIONS

- Intel Xeon E3-1245
- NVIDIA Quadro K4100M
- 16GB memory
- 256GB SSD
- 1TB hard disk

The Z1 takes its name from the shape of its hinge system, which allows it to be lowered and opened up

The good & the bad

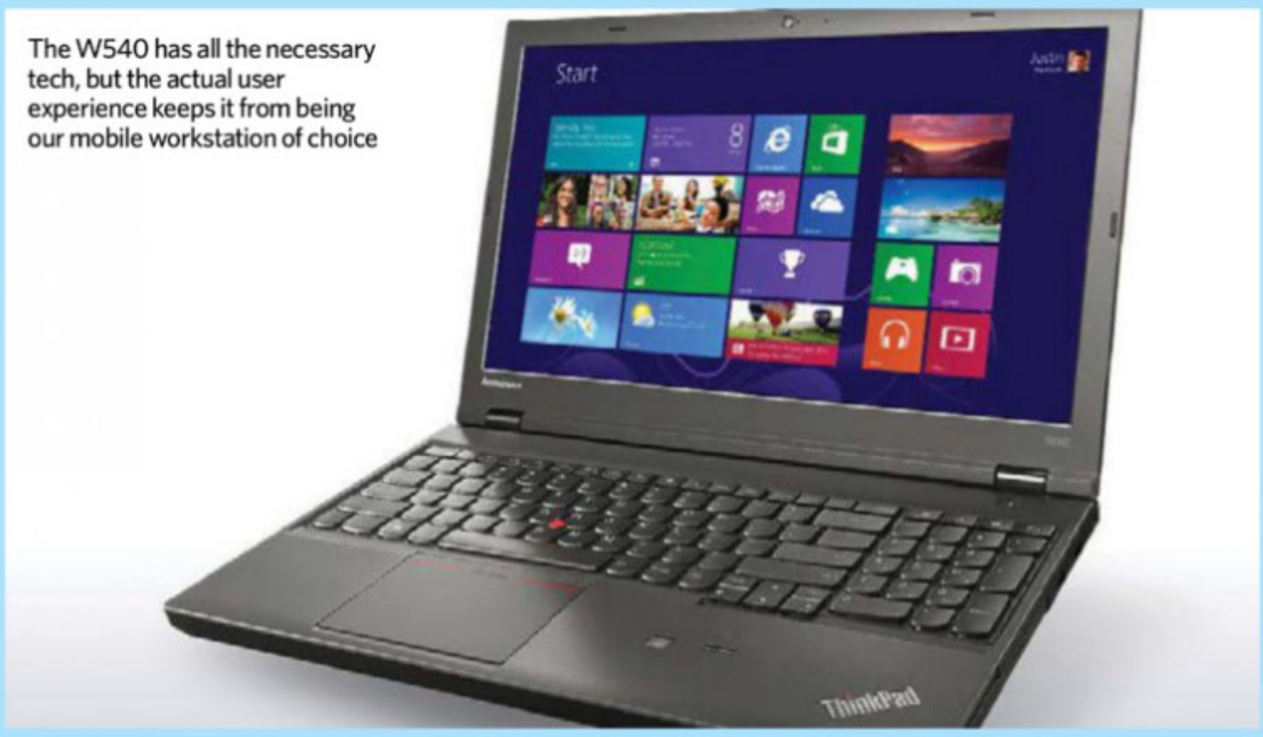
- ✓ Fast CPU performance
- ✓ Fast GPU performance
- ✓ Up to 32GB ECC memory
- ✓ Fantastic display
- ✓ Upgradeable components
- ✗ Impossible to have more than four CPU cores
- ✗ Fiddly lowering mechanism
- ✗ Very bulky design
- ✗ Majority of ports difficult to access

Our verdict

Features	9/10
Performance	9/10
Design	10/10
Value for money	8/10

"The Z1 G2 is the first all-in-one that's a serious alternative to desktop rendering workstations"

Final Score 9/10



The W540 has all the necessary tech, but the actual user experience keeps it from being our mobile workstation of choice

Lenovo ThinkPad W540

With all the makings of a top-end mobile workstation, the Lenovo ThinkPad W540 looks like a powerful contender

REVIEW BY Orestis Bastounis, technology writer, UK

The Lenovo ThinkPad W540 is a 15.5-inch mobile workstation with enough hardware muscle to deliver superb rendering performance. It has a 2.8GHz quad-core Intel Core i7 4900MQ processor, which flies at 3.8GHz in Turbo Mode. There's an Nvidia Quadro K2100M with 2GB of video memory, a mid-range mobile GPU that delivers performance levels almost on par with those of last year's K3000-equipped 17-inch mobile workstations, and up to 16GB of memory.

There are a few useful extras too. Lenovo surely had graphics artists in mind when it designed the ThinkPad W540, since there's built-in X-Rite hardware for colour calibration. It's far simpler and quicker to use than most calibration tools – run the software, close the lid, listen to the beeps and when you open it, you'll see the effect of the new colour profile.

Its widescreen IPS display looks fantastic and is touted as 3K, since it has a resolution of 2880x1620. That's an accurate term, since it's exactly 50 per cent wider and taller than 1080p and retains a 16:9 screen format. However, scaling issues can arise with some graphic design software.

Additionally, along with four USB ports, a built-in number pad, optical drive, SD card slot and smart card reader, there's a 10Gbps first-generation Thunderbolt port and an Intel AC7260 802.11ac wireless adaptor.

While there's plenty of quality hardware inside the W540, the overall user experience was awfully frustrating. The W540 is overloaded with bundled software. It didn't start well when the first thing that appeared was a warning that the bundled Norton Internet Security trial had expired, followed by another saying it conflicted with Microsoft's Windows Defender. Then we got lost in a pile of useless proprietary system software.

The spacious trackpad lacks physical buttons, but seems to push inwards like a space bar – a somewhat puzzling design choice we're not keen on. The keys are also weirdly shaped and aren't our ideal choice.

Then we had trouble getting the Quadro to work, with lower-than-expected performance as software used the integrated Intel HD4600 instead. In the Bios, there's an option to switch between balanced and high performance, but not to use Nvidia Optimus. After a lot of faffing about we got it working, but this was another poor experience.

The review unit shipped to us only came with a 500GB hard disk, rather than an SSD, and 8GB of memory, which affected a few of the performance results. While the Cinebench OpenGL score of 68.29 is reasonable, it was pipped by the similarly specced Dell M4800. Likewise, in 3ds Max, the 1080p Underwater scene took slightly longer at 23 minutes 29 seconds.

We're underwhelmed by the W540. Although everything is in place for a decent mobile rendering setup, the frustrating issues that we experienced (along with others, after a quick look on Lenovo's forums) means we'd choose a different rendering laptop.

Essential info

Price: £2,108 / $3,521 US

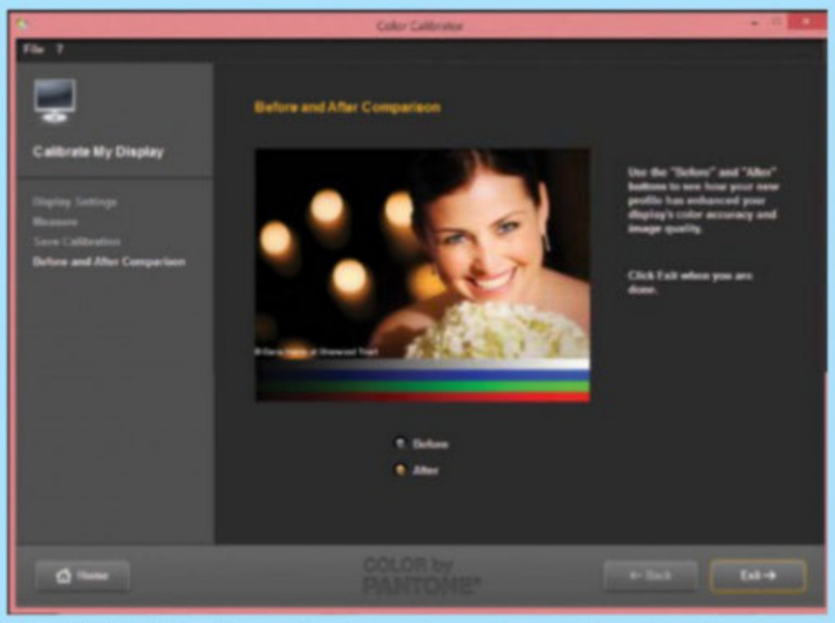
http://shop.lenovo.com/gb/en/laptops/thinkpad/w-series/w540

OPERATING SYSTEMS

- Windows 8.1

TECHNICAL SPECIFICATIONS

- Core i7 4900MQ processor
- Nvidia Quadro K2100M
- 8GB DDR3 memory
- 500GB hard disk
- 15.5in IPS display
- 2x USB 3, 2x USB 2, Thunderbolt



Using the built-in colour calibration software is a quick and simple process, which is one of the selling points for the Lenovo ThinkPad W540

The good & the bad

- ✓ Great screen
- ✓ Reasonable overall performance
- ✗ Bloated with bundled software
- ✗ Teething issues with Nvidia Optimus GPU switching
- ✗ Horrible trackpad

Our verdict

Features	8/10
Performance	7/10
Design	7/10
Value for money	7/10

"Despite the graphic artist-friendly visuals, the w540's user experience was disappointing"

Final Score 7/10

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The Unreal Game Engine

Andrew Finch goes in-depth on the creation of videogame assets using the Unreal Development Kit

REVIEWS BY Larissa Mori, 3D Artist magazine

***The Unreal Game Engine: A Comprehensive Guide to Creating Playable Levels* certainly promises a lot for those aiming for a role within the games industry, with the introduction stating that the book will be invaluable in helping to build a portfolio that will land you your dream job.** It's a bold statement, but not one that overstates fact – even if you are just a curious hobbyist, Andrew Finch has presented a truly excellent resource, knowledgeably revealing just what it takes to create your own game level with the Unreal Development Kit.

The training itself is not entirely for beginners. It requires a basic knowledge of software, such as 3ds Max and Photoshop, but does assume the reader is new to UDK. For most of the book, Finch describes the steps he takes to create the game environments of an Italian courtyard, submarine pen and zombie town. He goes from an empty scene with a basic player to creating assets from scratch in 3ds Max, texturing them, adding a water surface and custom sky box, creating post-effects such as fog and particles and more. Cleverly interspersed with these are focused tutorials on topics such as weapon design and use of lighting, making the book a very interesting read from beginning to end.

The book really does what it says on the tin. Using the training offered here, you will find yourself capable of creating standalone, playable game levels with detailed environments, which you can present to future employers or friends alike. It's a perfect introduction to the power of Unreal.

Info

Price: £30 / $50 US
www.3dtotal.com

AUTHOR Andrew Finch
ISBN NUMBER 978-1-909414-04-4

Our verdict

Quality of training	9/10
Design	7/10
Overall usefulness	8/10
Value for money	9/10

> "A very useful introduction for anyone looking to try their hand with the Unreal Development Kit"

Final Score 9/10

3ds Max Projects

Covering a wide variety of topics in a useful way, this book is an enjoyable introduction to all things 3ds Max

Written by a multitude of renowned artists, *3ds Max Projects* focuses on the CG specialities of each. The result is a book that professionally covers a wide variety of disciplines and expertise.

The first three sections in particular, which introduce character creation, rigging and animation, are very helpful if you're a beginner. Starting with a 2D character concept, Dmitry Shareyko and Seid Tursi will guide you through modelling the 3D version of the character, UV mapping, painting textures in ZBrush and Photoshop and compositing it all together. In the next section, Jahirul Amin takes over to show how that very same model can be rigged. Finally in section three, Fernando Herrera introduces both the theoretical principles of animation and how the character you've created and rigged can come to life in a scene.

After this stage the book starts to feel less cohesive, the focus moving from overarching projects onto smaller, more focused tutorials. There's some great content explaining principles such as clean topology and modelling vehicles for beginners, alongside Hickenbottom's tutorial detailing his own full character-creation pipeline. Also included are sections that introduce lighting and FX particles and dynamics. However, we couldn't help but feel more tutorials tied by a common theme, as with the opening of the book, might have worked better.

Nevertheless, If you are new to 3ds Max or want to discover more about a specific part of the software's project pipeline, then this book offers an easy and accessible way to start out.

Info

Price: £30 / $50 US
www.3dtotal.com

AUTHOR A variety of artists: Jahirul Amin, Matt Chandler, Samuel V Conlogue, Andrew Finch, Arturo Garcia, Fernando Herrera, Andrew Hickenbottom, Diego Maia, Dmitry Shareyko, Andrezej Sykut and Seid Tursic
ISBN NUMBER 978-1-909414-05-1

Our verdict

Quality of training	9/10
Design	6/10
Overall usefulness	7/10
Value for money	7/10

> "At times it seems fragmented, but the topics are well laid out and informative"

Final Score 7/10

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Samurai
Hasan Bajramovic

workspace 3D

Inside guide to industry news, studios, expert opinion and education

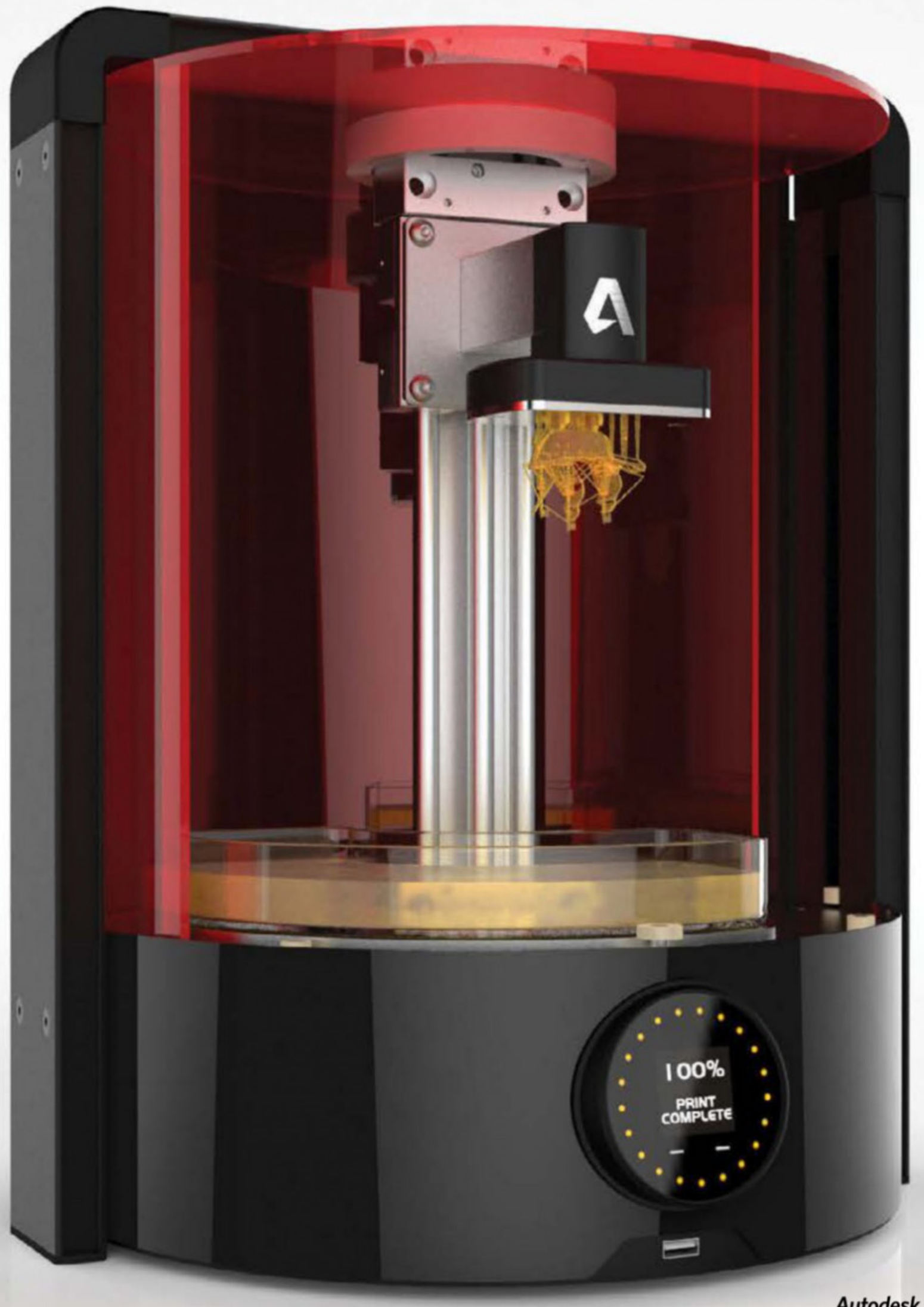
104 News
Industry news
We learn about Autodesk's 3D printer, how jobs in animation are at a record high and the new tool Craft CameraFX

106 Project focus
Edge of Tomorrow
VFX supervisor Daniel Kramer gives us a rundown on time travel, aliens and war

108 Studio access
Main Road|Post
We take a look at how Main Road|Post is putting Russia on the VFX map

110 Industry insider
Will Cohen
CEO of Milk Will Cohen tells us more about the recent trend for VFX work in high-end TV

inside



Autodesk announces its own 3D printer
Autodesk enters the 3D printing market and reveals its open-source 3D printing platform, Spark

> We hope to make it possible for many more people to incorporate 3D printing into their design process

Carl Bass President and CEO of Autodesk. Page 104

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Ryan Ward on **01202 586415** or **ryan.ward@imagine-publishing.co.uk**

Though historically seen as too expensive, stereolithography, or SLA, results in smoother, more complex final models

Autodesk unveils new 3D printer

The company aims to accelerate the future of 3D printing with its own hardware and open-source software

After many years of creating world-renowned software and apps for computer graphics and, more recently, 3D printing, Autodesk is now delving into hardware with its very own stereolithography 3D printer. Unlike the more common fused deposition modelling printers, where a heated plastic is extruded from a nozzle to create a shape in 3D space layer by layer, stereolithography 3D printers additively build models by using a laser to harden the pattern into plastic resin layer by layer, turning it solid before the unused material is then disposed of. Though historically quite expensive, the method is very fast, as well as incredibly accurate and capable of creating more detailed objects.

As well as the 3D printer, Autodesk has also announced a 3D printing platform called Spark, and said it will be making both the design of the printer and Spark open and freely licensable. This means other manufacturers can modify Autodesk's printer should they wish to do so, or use Spark for their own 3D printers for further development and experimentation.

"For years, I've been fascinated by the promise and frustrated by the reality of 3D printing," said CEO Carl Bass on Autodesk's blog site, In The Fold. "Today, Autodesk is announcing two contributions to help make things better." According to Bass's post, the printer will be able to use a broad range of materials, with the CEO going on to say that he looks forward to "lots of exploration into new materials." Despite the company not having directly revealed pricing at the time of going to print – only saying that both the printer and the platform will be available later this year – Bass has allegedly revealed that the price could be around $5,000 and the printer will be targeted at more professional users for creating small objects, such as medical devices or custom jewellery.

Introducing Spark

With Spark – Autodesk's open-source software platform – the company hopes to inspire many more people to incorporate 3D printing into their design and manufacturing process, explaining that Spark will "make it more reliable yet simpler to print 3D models, and easier to control how that model is actually printed."

Autodesk has decided to adopt an open approach to both its printer and Spark, revealing that it will be easy to integrate new materials or enhance its capabilities

● **HAVE YOU HEARD?** • Warner Bros and Legendary Pictures are already moving forward with a sequel to *Godzilla*

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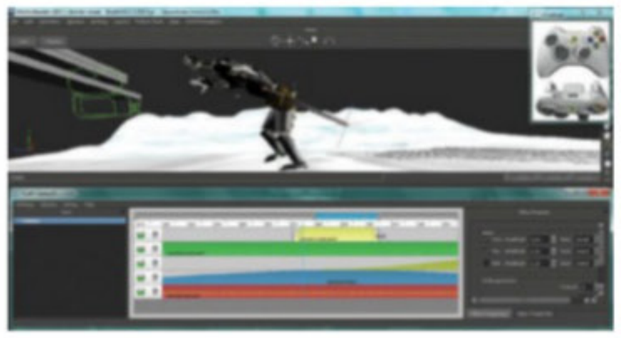
Craft CameraFx unveiled

A new tool promising easier camera animation

Developed alongside requests from Ubisoft Toronto, who used the tool for the cinematics in Tom Clancy's *Splinter Cell Blacklist*, Craft Animation's Craft CameraFx for MotionBuilder is now available to the public for $1,995. Presenting a layer-based workflow to animate cameras in 3D scenes, the plug-in enables users to control virtual camera moves with a mouse or an Xbox controller, then apply effects such as noise to make a camera shake at precise moments.

"We relied on Craft CameraFx to help us achieve realistic camera animations in *Splinter Cell Blacklist*," says Randy Yuen, camera specialist at Ubisoft Toronto. "We saved time by using this toolset, which helped our team deliver game animations at a very high level of quality." Aimed at the gaming, VFX and previs markets, Craft CameraFx is now available for MotionBuilder running on Windows operating systems, with plans for a possible expansion into more operating systems, input devices, and host software in the future.

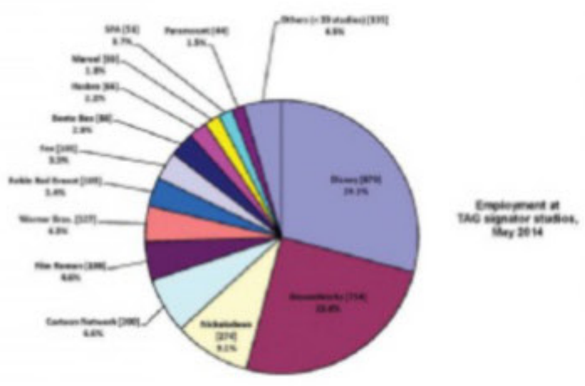


Craft CameraFx is priced at $1,995, and is available now for users of MotionBuilder 2012, 2013, 2014 and 2015. Visit **www.craftanimations.com** for more details

Animation jobs at a high

Animation work in the LA-area is booming

According to data collected by the Animation Guild, more members are now in the Southern California jurisdiction than ever before – now 3,354, up from around 1,250 in 1986. Half of this work, Guild organiser Steve Kaplan told Deadline.com, is on animated features, with Disney and DreamWorks employing 29.2% and 25% respectively. TV animation jobs are also increasing, reportedly driven by factors such as new media, like DreamWorks's internet content for Netflix, as well as animation's sheer profitability. It's no surprise when in 2013 alone, animated features made around $3.5 billion worldwide.



According to the data, other employers include Nickelodeon, Warner Bros, Fox and Marvel. Image Courtesy the Animation Guild blog

MODO for MakerBot

The Foundry brings MODO to the MakerBot 3D printer

The Foundry customers interested in purchasing a bundled software package with a MakerBot Replicator or Digitizer product can find out more at **www.thefoundry.co.uk/products/modo/3d-printing**

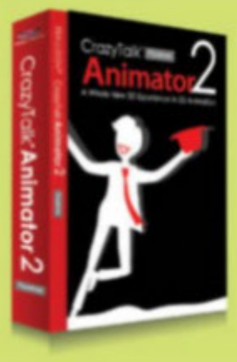
The partnership, announced at The Foundry's San Francisco launch event for MODO 801, is anticipated to ensure a seamless integration of MODO and the MakerBot 3D printing platform. For users of the 3D software, there is a perk: a 10% discount on selected MakerBot Replicator printers.

"Artists have the ability to effortlessly blend, add and subtract objects, then export to a watertight mesh – a process we believe revolutionises 3D modelling and offers infinite creative possibilities for MakerBot 3D printer users," said Christopher Kenessey, chief sales and marketing officer with The Foundry.

Software shorts

Bringing you the lowdown on product updates and launches

Crazytalk Animator 2 for Mac



After winning the Best of Show at Macworld/iWorld 2013 with CrazyTalk7's talking heads, Reallusion has launched CrazyTalk Animator 2 for Mac. New features include the ability to edit 2D motions and view them from any angle, as well as HumanIK motion editing and character customisation. CrazyTalk Animator 2 is available from £38. For more information, visit www.reallusion.com/crazytalk/animator.

Flame Painter 3

Escape Motions has revealed the new Flame Painter 3, available for Windows and Mac in a personal edition for $30 and professional edition for $90. New in the release is Flame Painter Connect, a plug-in between the tool and Photoshop, plus the ability to use a Wacom tablet pressure pen and Leap Motion camera, among others. To see more, visit www.escapemotions.com/products/flamepainter.

Quixel SUITE

Quixel has announced Quixel SUITE, a new bundle of its popular games texturing tools, NDO and DDO, as well as the new 3DO, a lightweight model and material viewer that lets artists review their work in Photoshop without having to jump between applications. The suite also includes MEGASCANS, an online library containing over 1,000 real-world scanned materials for download.

H.R. Giger 1940-2014

Surrealist H.R. Giger, who designed the character and sci-fi sets for *Alien*, has died

Giger studied architecture and design in Zurich before embarking on a successful career in the art and the movie industry, going on to win an Oscar for Best Achievement in Visual Effects in 1980 for his work on *Alien*, for which he designed the infamous xenomorph alien creature.

Giger later also contributed designs to *Alien 3*, *Species*, *Alien vs. Predator* and *Prometheus*, among other films. He died in hospital following injuries sustained after a fall down the stairs at his Zurich home, aged 74.

DID YOU KNOW? ▪ Training site CG Cookie is launching the first online marketplace devoted exclusively to Blender

Project Focus

Edge of Tomorrow

VFX supervisor Daniel Kramer gives us the rundown on time travel, aliens and war in *Edge of Tomorrow*

Project *Edge of Tomorrow*

Description Set in the near future after an extensive alien invasion, Lt. Col. Cage finds himself in a perpetual time loop, living, dying and repeating the same brutal combat, over and over again

Company bio Sony Pictures Imageworks is the Academy Award-winning visual effects and animation unit of Sony Pictures Digital Productions, known for live-action visual effects, dynamic creature and character animation and all-CG animation

Country USA

Website www.imageworks.com

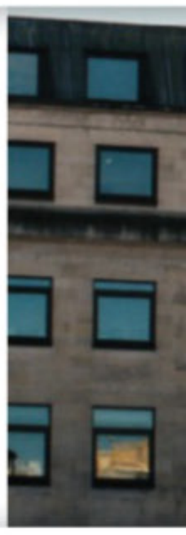
It's based on a Japanese novel called *All You Need Is Kill*," explains Daniel Kramer. Alongside Special Forces warrior Rita Vrataski (Emily Blunt), Lt. Col. Cage (Tom Cruise) is stuck in a time loop, each time learning more about an alien invasion, what's going on and how to defeat them. "I think the core idea from the book has to do with the author's interest in videogames – what if you were this videogame character that's running the same level over and over? Hopefully you meet the boss and defeat him."

Lt. Col. Cage begins each looped tour at a militarised Heathrow Airport, before deploying at the beachfront battlefield. "There simply weren't enough extras, so we built hundreds of mech suit soldiers running around and shooting that are all visual effects," continues Kramer. The war was presented in one layout file for a big, unified war instead of going shot-by-shot. All the major assets were placed in the beach scene and actions of the boats and dropships coming in were set up. "By doing that, as long as the cameras were basically placed in similar locations from loop to loop you would see the same action in the background," he explains. The production crew built a couple of acres of beach at the studios in Leavesden with a water section, surrounded by large containers that had greenscreens hanging down. "It was difficult weather, and being outdoors, those greenscreens took a beating. They rapidly just got dirtier and dirtier and were no longer great for pulling keys," admits Kramer.

Integrating the alien adversaries, known as Mimics, presented a number of challenges that were solved with low-tech solutions on-set. Big green triangles were stood on the set to loosely represent their volume and in the end, the Mimics animations were fitted to the action. "The Mimics were so fast and unpredictable in how they were described and we were still fleshing them out when we were shooting, so it was just a lot of pantomime on set, like 'hey, they're over here'," Kramer says. "I wish we had really great reference for where they were for eye lines, but due to how fast they were and their unpredictable nature, it was difficult."

Each limb on a Mimic is a collection of 15-20 tentacles wrapped together in a very complicated way. Because the Mimics had so many tentacles, it was deemed far too complicated to ask an animator to deal with all the inter-penetrations and sliding of tentacle to tentacle. "We realised we needed to build a procedural system for that," Kramer states. Technical animator, Dan Sheerin was tasked to build an animator-friendly limb system. "He defined a centre curve for the main limb and grew new tentacles down that limb, weaving them down that main core," he continues. The algorithm was designed so that none of the tentacles would penetrate each other and provided the option to introduce active noise into the system so they could writhe. The overall results are impressive indeed!

A Photo: David James



Contributors

Daniel Kramer
VFX supervisor

> "There simply weren't enough extras, so we built hundreds of mech suit soldiers running around and shooting"
> **Daniel Kramer,** VFX supervisor

A Many of the special effects were created on-set, such as explosions. This caused some problems for the VFX team. For instance, there was often black smoke pluming up and contaminating the view of the greenscreens, making the effects work a challenge

B The large rail guns that Emily Blunt's character carries on her back were too cumbersome for the actor and affected her performance. As such they were removed, and the VFX team extended the mech suit for the remainder of the film

C The actors on-set that wore military outfits of different nations were put on a turntable for full body imagery scans and texture acquisition. High-resolution FACS (high-resolution facial scans) for textures were also captured for archives

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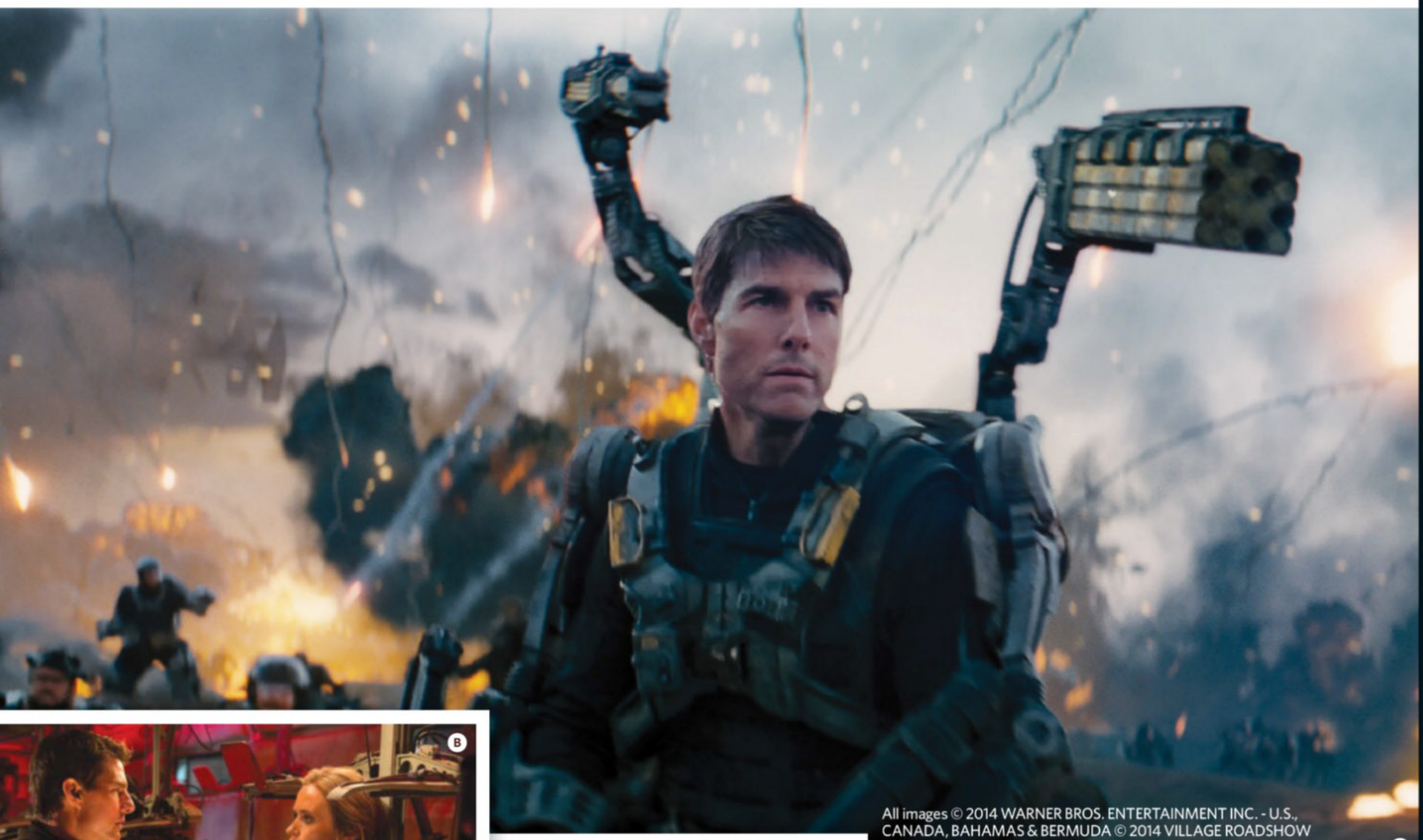

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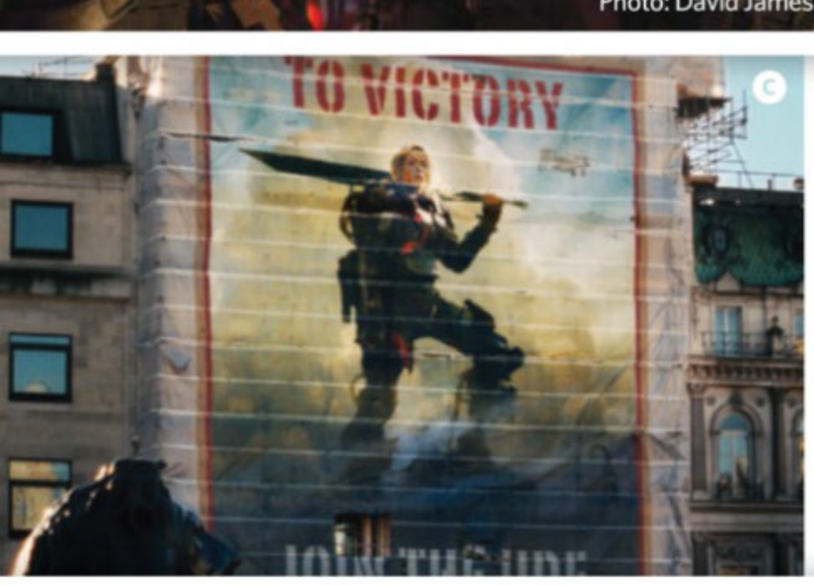
F

B Photo: David James



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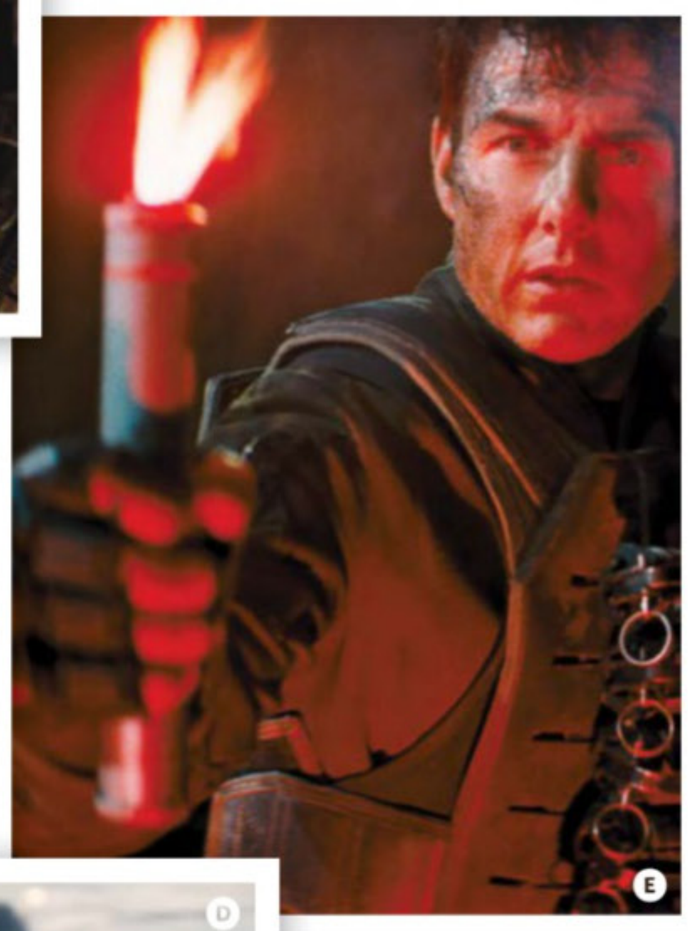

E

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Mobilising the CG infantry

An in-house flocking system coupled with KATANA and Arnold gave Sony a very responsive pipeline to populate shots at Heathrow Airport with hundreds of military personnel

"Animators animated cycles, formed them into groups and baked out to disk as Alembic data, and a layout artist placed them," explains Kramer. "A simple lightweight XML text file containing transform and animation offset data for each character was sent to the renderer and all the textures were on disk. KATANA then pulled all that information in and Arnold instanced them around those locations, with everything expanded at render time so it was super memory efficient. The nice thing about it is that we can load those characters into Maya and leverage the Open GL cards to scrub many hundreds of characters interactively."

D It was important to director Doug Liman that almost every single scene featured death, destruction, explosions or planes crashing to emphasise the realism of the situation. The team had a lot of freedom to choreograph the action of the war

E The core idea for the film came from the book *All You Need Is Kill* by Hiroshi Sakurazaka, in which the lead character finds himself stuck in a time lock, repeating the same day over and over. It's a little like *Groundhog Day* but with aliens and rail guns

F Characters who wore the mech suits and required accurate 3D models, such as Tom Cruise or Emily Blunt, had extensive sessions of laser scans to capture all of the details that were needed to make as convincing a mech suit as possible

Studio Access

Main Road|Post

With expert digital animation, this Moscow-based studio is putting Russia on the world's VFX map

Main Road|Post was founded in 2006 with a core group of only six people. It has since grown to 25 permanent employees under the leadership of VFX supervisor and general director Arman Yahin and senior technical director Mikhail Lesin. Its recent visual effects include crucial imagery in the 3D IMAX war drama *Stalingrad*

www.mrpost.ru

Country Russia

Clients Profit, Art Pictures Studios, Non-Stop Productions, Glavkino/Dago Productions, Channel One Russia

Main software Houdini, Maya, MARI, NUKE, Naiad

Contributors

Arman Yahin
Visual effects supervisor

Mikhail Lesin
Senior technical director

Andrey Maximov
Visual effects art director

Alexander Lipilin
Animation supervisor

Main Road|Post may have gotten its start by creating the opening titles for the TV mini-series *Leningrad*, but it capped 2013 as the main VFX vendor on Russia's top-grossing feature, *Stalingrad*. The first Russian film shot in 3D IMAX, *Stalingrad* required Main Road|Post to create 230 stereoscopic VFX shots, including digital extras in sweeping battle scenes, complex explosions and smoke and fire simulations. These effects were crucial to the film's depiction of the pivotal battle that took place during World War II.

Stalingrad wound up being the choice of Russia's Academy Award nominating committee for consideration as Best Foreign Language Film, and while it didn't earn the nomination, it certainly put Main Road|Post in the spotlight.

As the studio's VFX supervisor on *Stalingrad*, Arman Yahin recalls the challenges that were presented by the project, which was in fact the first time Main Road|Post was required to create VFX in IMAX 3D. "We had to make our work highly detailed – to a level that we have previously never reached before!" he tells us.

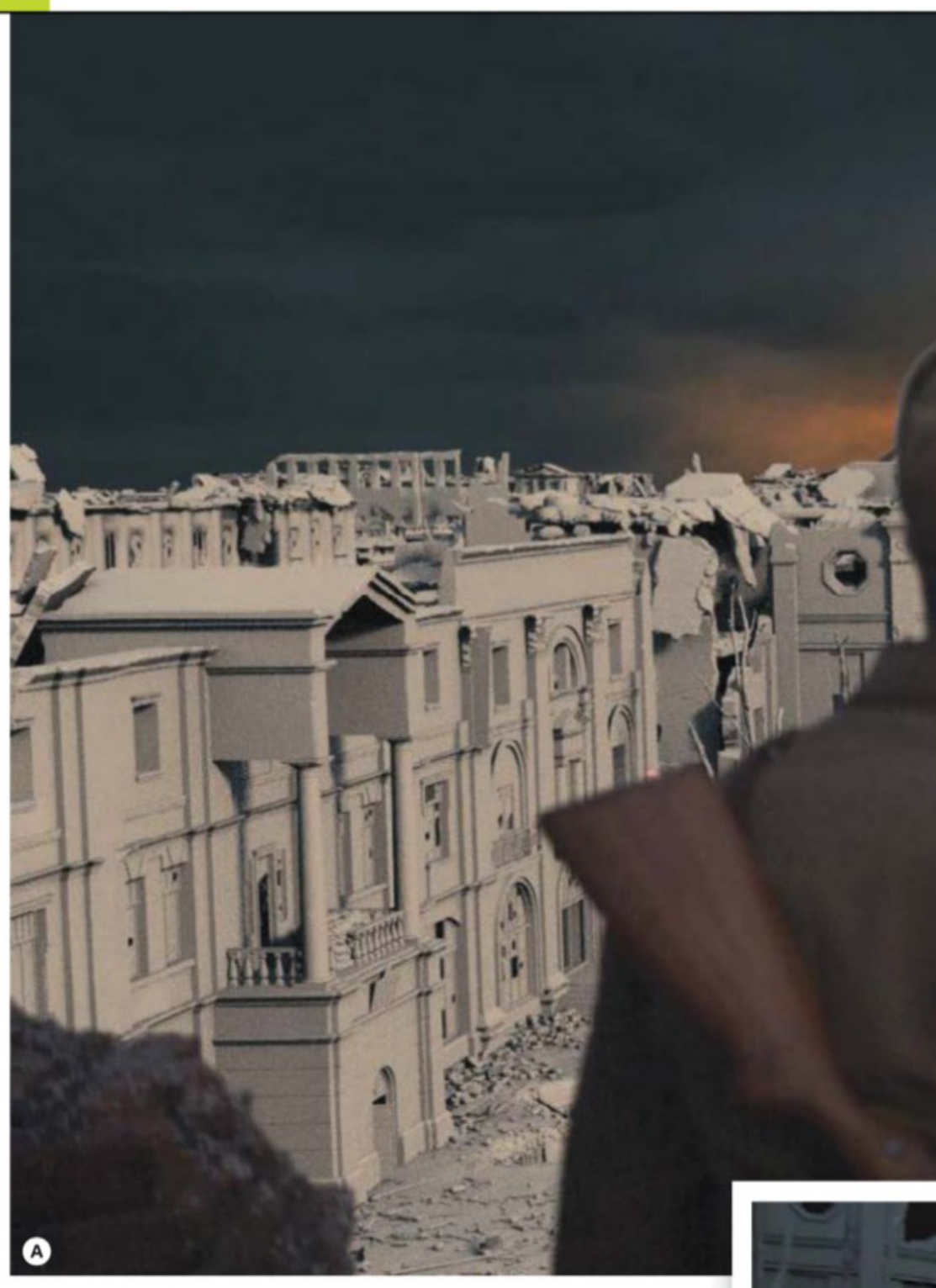
Stalingrad required Main Road|Post to push the limits of its simulation techniques for explosions and demolitions. "Our smoke was taken further and we progressed in the dynamics of our explosions, land and water alike," explains Yahin. "Also on *Stalingrad*, we pushed a new limit for simulated fire and we managed to get a very convincing result."

As senior technical director, Mikhail Lesin observes, "The main challenge on this project was that in stereo 3D, we couldn't use stock smoke, fire or explosions, so we had to make simulations in 3D. Additional difficulty was caused by the fact that some shots had both filmed and simulated effects in it at the same time. That meant our simulations had to match the live-action effects by appearance, texture, speed and depth."

> "Technology is constantly progressing and the demands of the viewers keep growing. It is vital for us to follow this, to always improve ourselves"
> **Mikhail Lesin,** senior technical director

Main Road|Post's reputation for achieving dynamic effects was previously seen in the 2013 feature, *Metro*. For that thriller, set in Moscow's subway system, the studio's simulation expertise helped heighten the drama with perilous water simulations that flooded underground tunnels. The studio has also developed a capacity to handle large amounts of character animation, as evidenced by its work on the 2012 dramatic feature, *August. Eighth*.

In *Stalingrad*, character animation was crucial to the believability of the battle scenes. As animation supervisor Alexander Lipilin notes, "The project's animation tasks can be divided into two groups: technical animation such as planes, tanks or debris,


A

B

Portfolio highlights

Here are some of the big movie projects Main Road|Post has worked on:

2013 *Stalingrad*
2013 *Metro*
2012 *August. Eighth*
2010 *Priest*
2009 *Admiral*
2009 *Inhabited Island 1 and 2*
2008 *Admiral*
2008 *Wanted*
2007 *TimeShift*

All images © Art Pictures Studio, Non-stop Production. Images courtesy Main Road|Post.

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E

C

D

and character animation for CG crowds. The first one was done entirely in Houdini, widely employing Houdini's procedural capabilities. For the character animation we used a great variety of techniques and the methods were revised several times during the production process to achieve better results and to improve efficiency."

Especially significant is the fact that for all of its recent feature assignments, Main Road|Post was involved on all levels – from postproduction to final shot. The opportunity to contribute to the look development of its work is something that the studio values enormously. They feel that this kind of creative freedom will lead Main Road|Post to push the studio into new terrain. As Mikhail Lesin puts it, "Technology is constantly progressing and the demands of the viewers keep growing. It is vital for us to follow this, to always improve ourselves. We are madly in love with figuring out new technologies and achieving ever more impressive visuals."

A We received a version of the *Stalingrad* script two years before launch and drew a few concepts," says VFX supervisor, Arman Yahin. "We offered artistic solutions and the producers allowed us to use them"

B A massive explosion thwarts an assault mounted by soldiers. *Stalingrad* challenged Main Road|Post to expand its fire simulation abilities. The result is one of the film's most memorable scenes

C "We created a pre-vis with a wireframe animation of the whole crash," explains VFX art director Andrey Maximov. "Afterwards, 17 cameras were placed to capture the action from different spots"

D "The core of our system is Houdini. Everything is sent into it," explains Mikhail Lesin. "It is in Houdini that all the shading, lighting and final renders are made before being sent to compositing in NUKE."

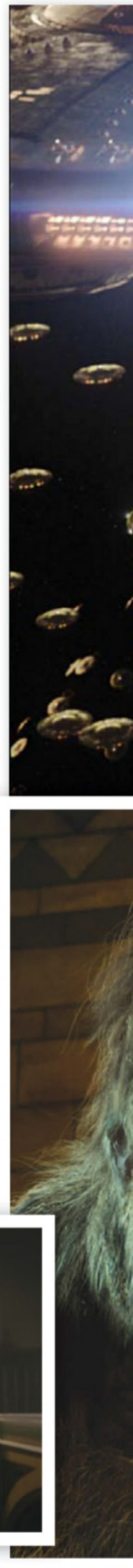
E Main Road|Post built digital views of bombed-out structures. "For reference, art director Sergei Ivanov stocked us with a large amount of historical images of the ruins," explains Arman Yahin

Industry insider

Will Cohen

CEO, Milk VFX

CEO of Milk VFX, Will Cohen, tells us about starting his own visual effects studio and the recent trend for high-end VFX work on TV



About the insider

Job title CEO
Location London, UK
Company website www.milk-vfx.com
Biography Will Cohen is one of the founders and owners of Milk, a London-based, boutique visual effects facility launched in June 2013. Prior to the launch of Milk, Will was managing director of Mill Film and TV for five years, having joined the company in 2003

When The Mill closed down its TV and Film department last year – just as the VFX industry awaited the results of Rhythm & Hues' bankruptcy auction – six senior artists, including Mill TV's managing director and executive producer Will Cohen, were suddenly left without a job. With credits in everything from *Merlin* to *Les Misérables*, however, they also faced a new opportunity. Together, the team founded their very own boutique studio in London. Milk VFX started out in June 2013 and has already won a BAFTA Craft Award for its remarkable work on *Doctor Who*.

"I completely understand, with the financial makeup of The Mill – which is 80 per cent focused on making television commercials globally – why they made that decision," explains Cohen, who is now CEO at Milk. "For us, there was suddenly a choice. Are you going to get a job at another company, or do you believe in your team and the industry you work in enough to take this as an opportunity to start your own studio? The answer was an overwhelming yes, we're absolutely going to go for it and start our own studio. It's been very liberating."

So far, Cohen and his team have worked on both feature films such as *47 Ronin*, as well as on big budget visual effects for television shows such as *Doctor Who* and the third series of *Sherlock*.

Was it challenging to found your own visual effects company and stand out among so many of the other big players in the industry?

I think many people probably thought we were completely insane! We're in a very privileged and lucky position. It's easy for me to say that a year later – there's a lot of freedom when it's artist-based and you have a lot of experience and you all know each other like at Milk. If you want to invest in certain technology and you have the money, for instance, you can just do it, and there's less of a corporate structure. That's very liberating.

How do you hope people will think of Milk in the future? What do you aim to achieve with the studio?

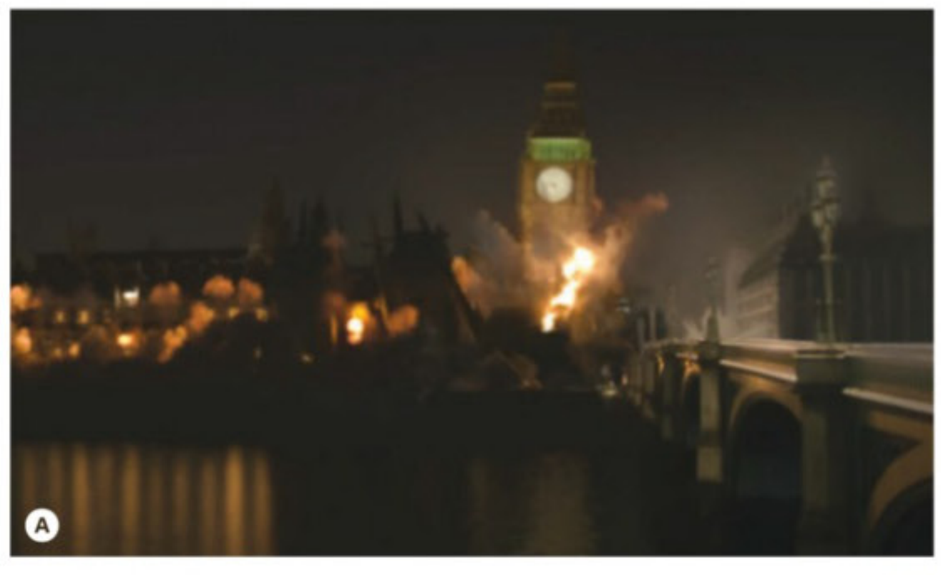
Our main objective is to create work of outstanding excellence in film and TV, really, and to stay at a roughly similar size as we are now. Greed is an awfully harsh word, but I think there's been a bit of a generational shift in the industry. If I look around me to the people I spent many happy years working for in visual effects, I think my personal objectives are probably more modest than theirs.

If you find yourself opening in 2014, I wouldn't expect to get massively rich from starting a visual effects studio. It's more about working with people you love every day and having a rich experience in your working life – especially because most spend an inordinate amount of time at work!

Do you think visual effects for high-end TV shows are becoming so impressive that they are rivalling film VFX, or one day could be?

The fact that we're now dealing with 4K in TV, whereas I'm working on a film at the moment which is in 2K, and that the file types are getting larger in television than they are in the cinema, or the fact that in the last year we've done one stereo film and two stereoscopic TV programs, seems absurd.

In the first decade of this century, computer games have acquired very sophisticated graphics and movies got better and better in terms of the quality of the visual production values. I think TV started to think 'how do we compete for attention', because a child or teenager used to these recent advances won't go 'oh, it's a TV show so I'll forgive it a little bit'. The decreasing cost of technology also means that people who are making television are now able to harness all the same tools and techniques used in the cinema.



Portfolio highlights

Some recent features that Will Cohen has worked on:

2012-2013 *Doctor Who*
2013 *Ice Age Giants*
2013 *47 Ronin*
2013 *Sherlock*
2012 *Snow White And The Huntsman*
2012 *Les Misérables*
2012 *Simbad*
2012 *Dredd 3D*

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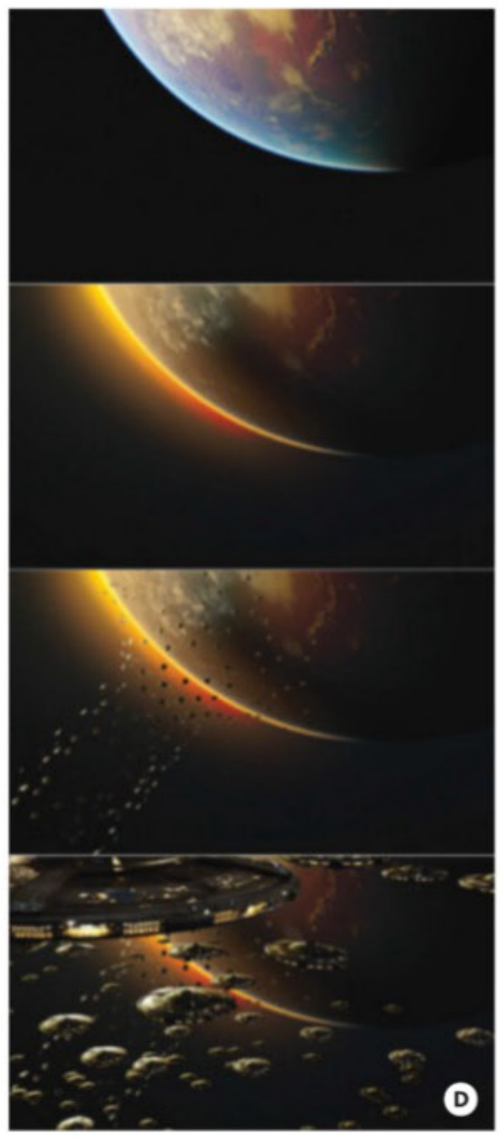
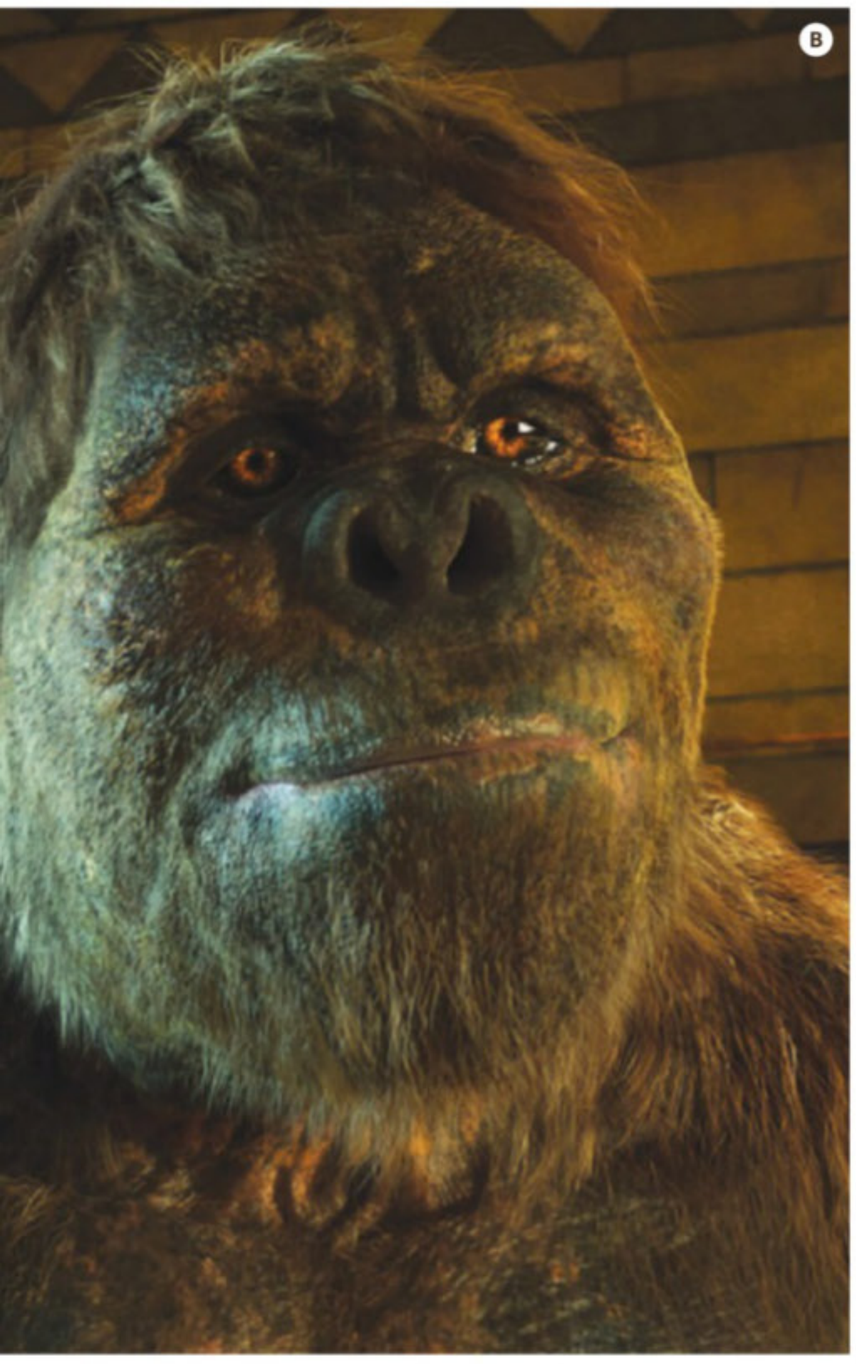




Doctor Who & Sherlock Images © BBC
David Attenborough's Natural History Museum Alive 3D images © Sky/Atlantic

Winning a BAFTA

Cohen explains how it felt to win a BAFTA for outstanding visual effects work on the BBC's *Doctor Who* 50th Anniversary special, *The Day of the Doctor*

"You hope for a win, but you don't dare to believe it will actually happen on the night," exclaims Cohen. "Winning the BAFTA is a fairytale ending to Milk's first year in business. For all the team here, as well as our *Doctor Who* clients at the BBC who believed in us, it really is validation for everyone's commitment to the project."

> "Greed is an awfully harsh word, but I think there's been a bit of a generational shift in the industry"

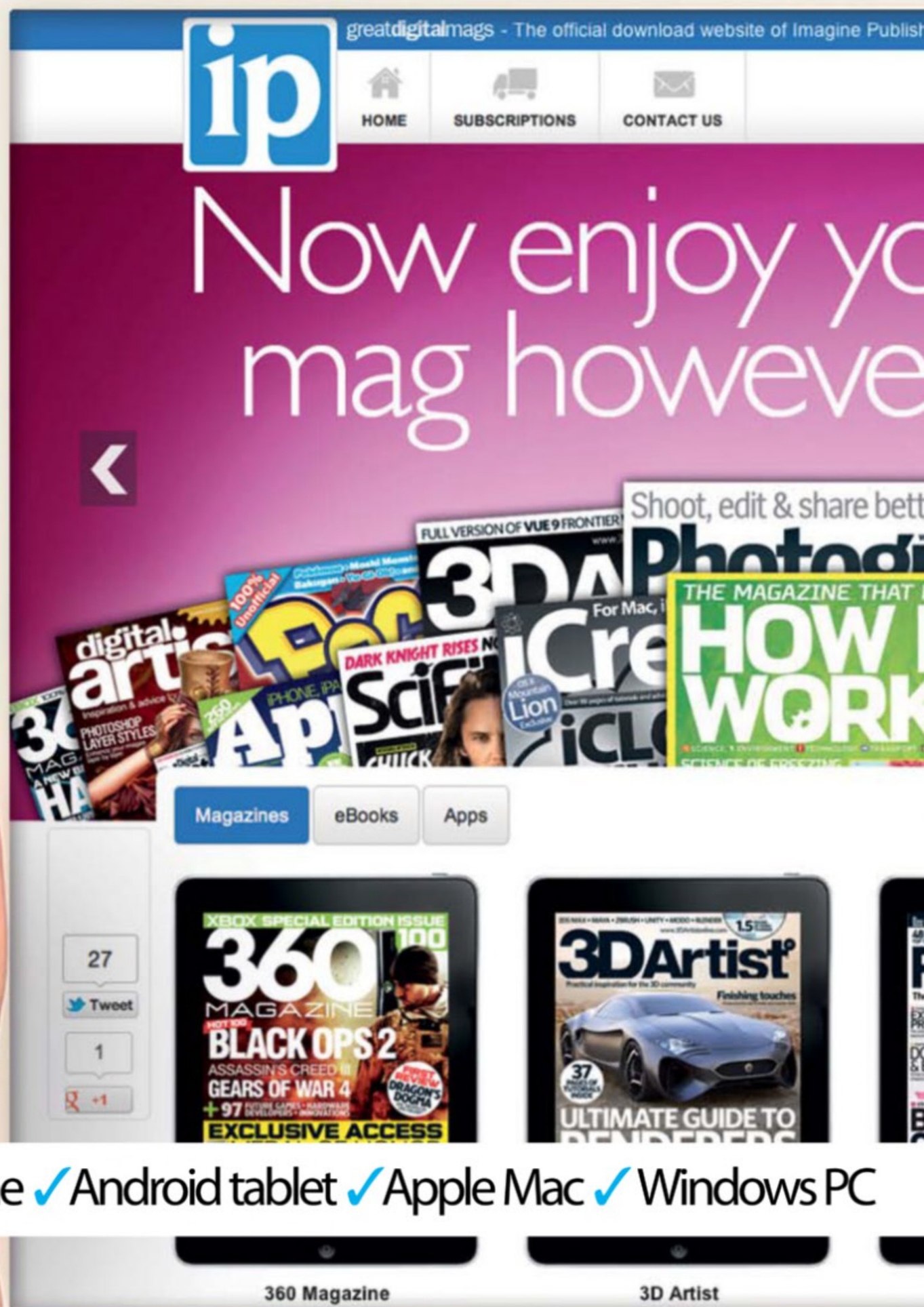
A Breakdown from Milk's work on the third series of *Sherlock*. Milk created 29 shots, including a large explosion that destroys London's well-known Houses of Parliament

B One of the characters – a gigantopithecus – created for the television series, *David Attenborough's Natural History Museum Alive 3D*

C "Nobody wants to create an experience for someone that is much worse than what you get in the cinema," says Cohen of creating TV effects

D Work from the BAFTA-winning 75-minute 50th Anniversary special of *Doctor Who*. Milk received the award after being in business for just ten months

E "Even if it's just cleaning up a lamp in a period drama, I don't think there's anything shot today that doesn't pass through the hands of a VFX artist," says Cohen



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